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The choice for agriculture, background report

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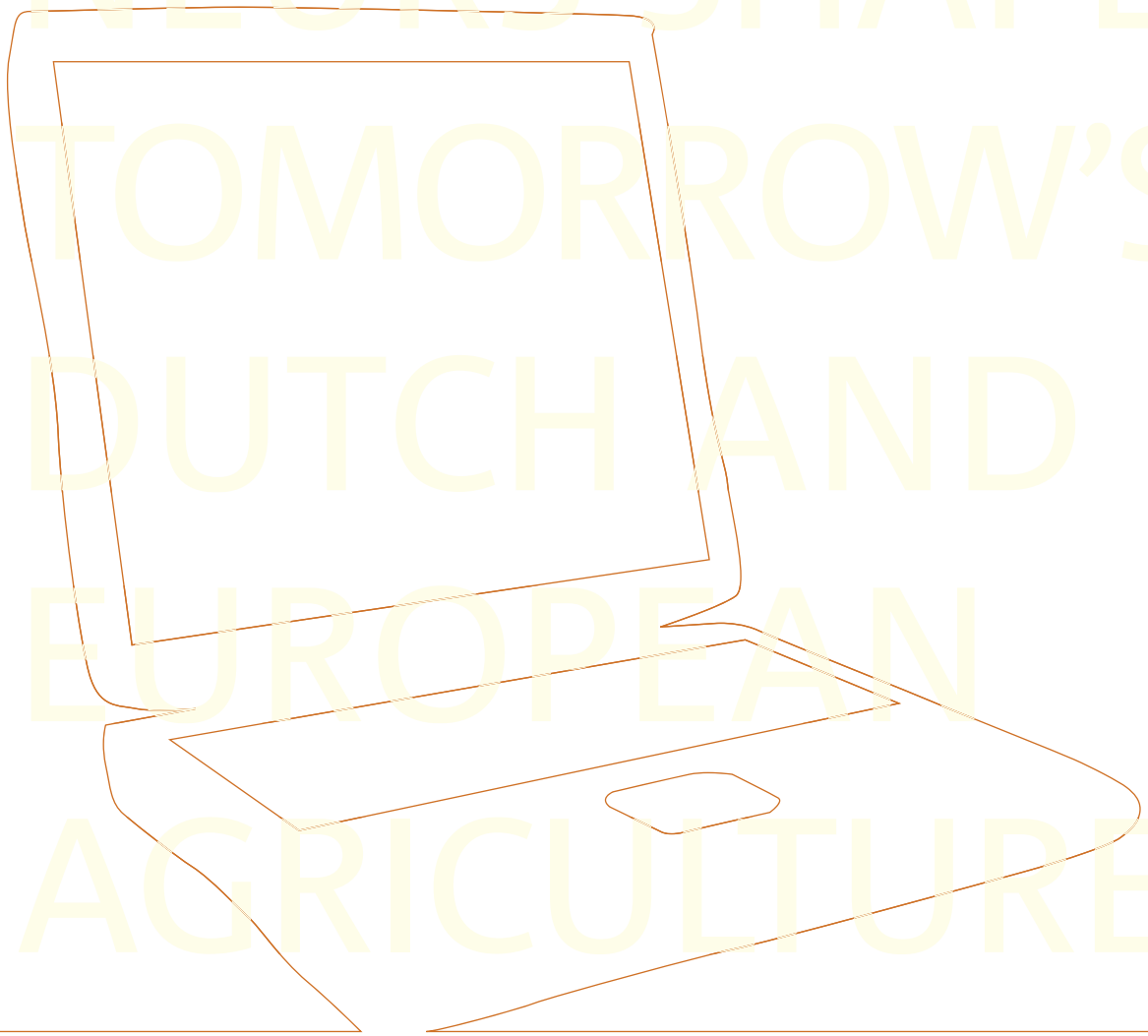

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ENTREPRE-NEURS SHAPE TOMORROW'S DUTCH AND EUROPEAN AGRICULTURE

PROSPECTS FOR THE AGRICULTURAL SECTOR IN THE NETHERLANDS

Wageningen UR
Under editorship of Huib Silvis and Kees de Bont

THE CHOICE FOR AGRI-CULTURE, BACK-GROUND REPORT

Preface

This is the background report for *Kiezen voor Landbouw* ('The Choice for Agriculture'), the policy statement of the Dutch government on the future of the agricultural sector. This report presents an as realistic as possible insight into the current position, the driving forces and prospects of the Dutch agricultural sector in the medium term, i.e. in the years up until 2015.

This study was carried out within the context of the policy support study performed by Wageningen UR. The project was carried out under the management of Dr H.J. Silvis, in close cooperation with C.J.A.M. de Bont (both LEI). Contributions to the various sub-studies were made by staff from Wageningen UR, in particular LEI and Alterra, as well as from other institutes. A complete list of the contributors is included at the rear of this report.

The interim results were published in the form of draft documents in the first half of 2005. These were discussed with the Project Manager, A.J. Vermuë, and with other representatives of the Ministry of Agriculture, Nature and Food Quality who prepared Minister Dr Veerman's Vision on Agriculture. Grateful use was made of the constructive comments and remarks arising from these discussions during the preparation of the final report. During the compilation of the report, use was also made of the results from Wageningen UR's Zachariasse Working Party, which employed a scenario approach in an exploration of the driving forces for future developments in the agricultural sector. In view of the overlap in the content, it was decided that the Working Party's results would be integrated in this study.

We are extremely grateful to the assistance provided by the Ministry of Agriculture, Nature and Food Quality's Steering Committee, which was formed for the purposes of this final report, comprised of Professor Dr G. Meester (Chair), D. Haagsma, G.G. van Leeuwen, and H.F. Massink.

Consequently, the field of knowledge and insights has been re-ploughed and processed in the preparation of a transparent insight into the future of the agricultural sector. This exploration reveals that although the growth circumstances and preconditions governing the coming period give cause for concern there is, nevertheless, scope for the further development of well-managed farms.

Professor Dr L.C. Zachariasse
Managing Director, LEI B.V.

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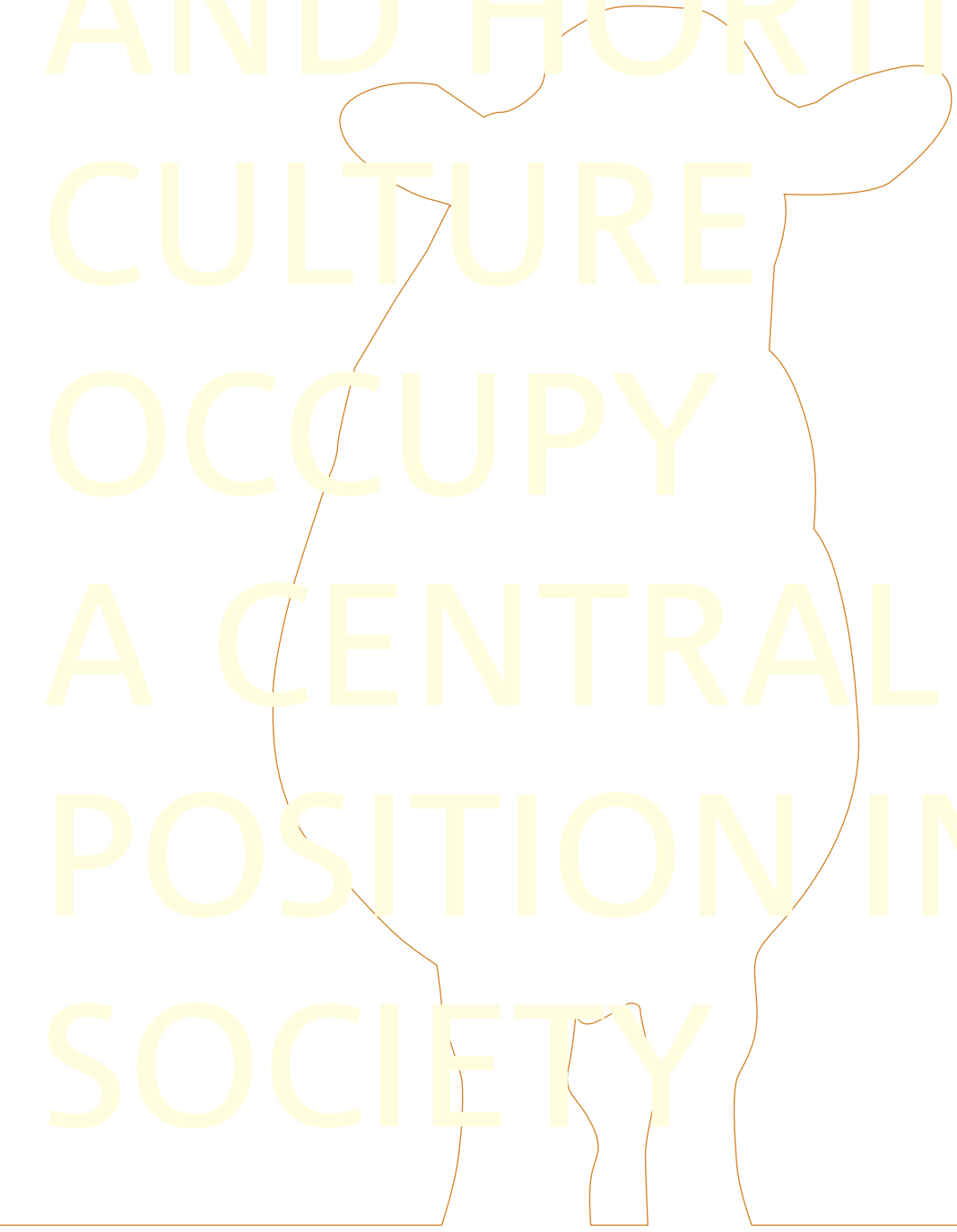


Summary

The sector's current position

- The agricultural complex is of considerable significance to the Dutch economy. The complex – encompassing the supply, production, processing and marketing of agricultural produce – offers employment to about 650,000 people, equivalent to 10% of the total national employment. The sector's contribution to the national income is also 10%.
- A considerable proportion of the operations of the agricultural complex relate to the trade in and processing of foreign raw materials (coffee, tea, cocoa, tobacco, and tropical fruit). About 70% of the economic significance of the agricultural complex relates to exports, the majority of which (about 80%) are destined for other EU member states. The Netherlands is one of the world's largest net exporters of agricultural products and foodstuffs. In combination, ornamental products, meat, dairy products and vegetables account for almost 75% of the net exports.
- Favourable elements of the Dutch sector's current position are the country's geographical location, the climate, and the proximity of many consumers with great purchasing power. The development of the common agricultural market and the associated market and price policies have been of great importance to the Netherlands' ability to make use of these benefits. The relatively high levels of knowledge and expertise in the sector also contribute to its strength.
- However, the agricultural sector also has a number of vulnerable areas, namely the restricted amount of space available in a densely populated country, the intensive use of land, and inputs detrimental to the environment. The land prices are relatively high. The same is also true for labour costs, which follow developments in other sectors of the Dutch economy.
- During recent years, the Dutch agricultural sector has developed less further in some areas than most other EU-15 countries. The Dutch production output has lagged as a result of measures such as the buying-up scheme in the pig farming sector. The development of the Dutch prices for agricultural products has been relatively unfavourable in recent years. With the exception of the floriculture, the Netherlands has lost market share for virtually all the main agricultural product groups in the most important EU markets.
- The distribution sector (the retail trade, the catering sector, and the wholesale trade) has undergone a pronounced concentration during the past decades. Nevertheless, and in part as a result of internationalisation, the competition between the supermarket chains is fierce. These developments are putting pressure on the prices of the primary-production and processing links in the chain.

- The agricultural industry is also highly concentrated, and is increasingly acquiring an international nature. The regional or national relationship between the primary producers and the other links in the chain (supply, marketing, and processing) is becoming increasingly less self-explanatory. Various sectors (flowers and plants, potatoes, dairy, and intensive livestock farming) serve as examples demonstrating that a relatively powerful processing and/or trading link is of great importance to primary production in the Netherlands. Many operations in the supply, processing and marketing links are organised in the form of cooperatives, as a result of which farmers and growers can exert an influence on adjacent links in the chain.
- A distinction can be made between a number of sub-complexes within the agricultural complex that are based on national raw materials. The pasture-based livestock farming sub-complex is still the largest sub-complex. Although the greenhouse horticulture sub-complex increased in importance in recent decades, it has nevertheless been in the doldrums for the past few years. The share of the arable-farming complex exhibited a favourable development in 2003 due to the high yield prices in that year; conversely, the share of the intensive livestock farming complex has remained reasonably constant since 1985. Within the open field horticulture complex, the shares of tree nursery and bulbs have both increased, whilst those of vegetables and fruit have decreased.
- The agricultural sector occupies about two-thirds of the Netherlands' entire land surface area. Since 1990, the area under cultivation has decreased by 4% to a little more than 1.9 million hectares in 2004. Grassland and arable crops account for the great majority of this area.
- In 2004, the Netherlands still had more than 80,000 agricultural and horticultural farms. During the past 25 years, the number of farms has decreased by an average of 2.3% per annum. At the same time, the average size of the farms has increased. The bigger farms account for a continually larger share of the production.
- More than one-third of the agricultural holdings are engaged in diversification or more in-depth operations that are intended to generate a supplement to the income from the agricultural operations. Almost half of the dairy farms are active in nature management. Although individual farms are able to generate a substantial additional income from these activities, for the time being their economic significance is limited to only a few percent of the sector's total added value. The importance of income from employment outside the farm has increased to an average of 10% for all agricultural and horticultural farms.

Driving forces

General

- Progressive economic growth is expected over the coming period in almost all regions of the world. For most of the transition and developing countries, this growth rate will be significantly higher than for the EU-15, the United States and Japan. Brazil, China, India and the new EU member states will exhibit particularly strong growth.
- The growth in the world's population will decline to around 1% per year over the coming ten years. Around 75% of the world's population lives in developing countries, and this proportion will increase further. The global demand for food will be determined more and more by the development of incomes per capita than by the growth in the population. For the richer countries, a higher income does not mean a greater demand for food.
- Incomes in Europe are expected to increase slightly over the coming years, while the population is expected to remain reasonably stable. In terms of demographic composition and lifestyle, important changes are expected: more immigrants, an ageing population, more working women, more single person households and a reduction in the number of children.
- In connection with the level of prosperity and the continuing individualisation, the demand for agricultural products is likely to diversify, on the one hand due to increasing immigration and familiarity with other cultures and new possibilities, and on the other hand due to the increasing need for variety, perception, convenience, health, quality and image.

CAP and WTO

- Agreements were made for the first time during the Uruguay round regarding the liberalisation of the markets for agricultural products. This means reduced export support and more conditions attached to internal support for agricultural production. A reduction in market protection will remain dominant for the coming years. The significance of trade preferences for particular countries or groups of countries will decline due to global liberalisation.
- This liberalisation is interlaced with European agricultural policy. Further reforms are expected for products like milk and sugar in particular. Decoupled payments will form a major part of incomes for land-based farms. In this regard, account must be taken of a relative decline (due to ceilings in EU expenditure) and desires for a simplification of the system.
- The changes in the policy, including the conditions for the payments (cross compliance) are of social importance in order to give the payments a lasting character. More scope is provided for national implementation within the payment policy and the rural policy, but this would appear to have no overriding effect on the internal competitive relationships.
- Due to this liberalisation, developments in countries like China, Brazil and Russia will gain a greater influence on the relevant agricultural markets. Brazil could thus greatly expand its exports, whereas China and Russia could become major purchasers of agricultural products, under favourable

economic conditions. However, in view of the possibilities for further production growth, the question is whether this will lead to an increase in the world market prices for agricultural products. We must also take account of more fluctuating prices – on the European market, too – as a consequence of liberalisation.
- Within Europe, the enlargement of the EU is generally favourable for sales by the Dutch agricultural sector. In addition, regulations in the fields of the environment, welfare, health, food safety, nature etc are gaining in significance within Europe, partly in the form of conditions relating to the payments. Compliance with regulations in the field of food safety and similar fields is a condition for access to the domestic and foreign markets.

Environmental policy
- The environmental impact of agriculture and horticulture is gradually lessening, although the rate of this reduction appears to have slowed over the last few years, and it will still take quite some time before the final objectives of various environmental aspects are achieved. In particular due to the composition of the production 'package' – a relatively large proportion of horticulture and a lot of intensive livestock production – the environmental impact of the Dutch agricultural sector is greater than in most other countries. Due to the high yields per hectare, the environmental impact per product unit is however often lower than elsewhere.
- Despite a strong decline in the use of pesticides, the desired situation has not yet been achieved. Quality standards for surface water and groundwater are still frequently exceeded. New legislation is in the pipeline that will bring the Netherlands more into line with other EU countries with regards to licensing policy. The policy will continue to focus on a drastic further reduction of the environmental impact and a reduction of crops' dependence on chemicals.
- By signing up to the Kyoto protocol, the Netherlands has committed itself to reducing its total greenhouse gas emissions by 6% in the period 2008-2012 in relation to the base year 1990. In order to achieve the national reduction objectives, maximum emission levels have been formulated for 2010. A ceiling of 7 million tonnes of CO_2 applies for agriculture and horticulture (i.e. not including the other greenhouse gases). This means a major reduction compared with the 8.1 million tonnes of CO_2 emissions in 2000.
- The current system of manure production rights and animal rights will continue to exist. A maximum will be set for national manure production. The buying up of these rights by the government over recent years made a significant contribution to the reduction of the production of manure.
- In accordance with the rules of the Nitrate Directive, additional usage norms will be implemented relating to animal manure and artificial fertiliser combined. In addition, there will be a separate norm of 170kg of nitrogen per hectare from animal manure. Holdings with more than 70% grassland may however use 250kg of nitrogen from animal manure on the grounds of the so-called derogation. There will also be usage norms for phosphate, which will also relate to phosphates from artificial fertiliser, in contrast

with previous norms. The norms will be gradually lowered until 2009. An evaluation of the derogation will take place in 2008, with the nitrate levels in the groundwater being of particular importance. If these levels do not fall sufficiently over the next few years, or if they increase, it is uncertain whether the derogation will be extended.

- The consequences of the Water Framework Directive for agriculture are still uncertain and are dependent on various choices that the Netherlands will need to make. This directive is aimed at raising the quality of surface water and groundwater to a 'good level' and keeping it at that level. In principle, this objective should be reached by 2015, but there an extension of this deadline is possible. This is dependent on the so-called 'catchment area plans,' which must be ready by 2009. When interpreting these plans, account should be taken of feasibility and possible economic consequences. Since approximately half of the burden imposed by minerals on surface water originates from agriculture, there is almost certainty no chance of a relaxation of the minerals policy (beyond derogation).
- The ammonia emissions from the Dutch livestock population has almost halved since the mid 1980s, to approximately 115 million kg in 2003. The objective set for 2010 (114 million kg for agriculture) is feasible, but the question remains whether this offers the natural environment sufficient protection.
- The drainage of agricultural land and the faster removal of the drained water from the area are estimated to account for about 60% of the drying out of areas of nature, compared with 30% due to the extraction of ground water for drinking water, industrial water and sprinklers. In 2010, the dried out area of land must have decreased by 40% in relation to 1985. This objective cannot be achieved if the current rate of change stays as it is. Measures within the framework of the reconstruction of the intensive livestock farming areas could make a substantial contribution to reversing the trend of the drying out of land.

Space

- Urbanisation will continue in the future, even if just due to the growth in the number of households. The demand for space for recreational green areas, infrastructure and water management will probably grow at the same rate. The *Nota Ruimte* heralds in a more 'liberal' policy, in principle offering more space for the increasing demand for rural housing. In view of the preferences of the citizens, one can expect that demand to be primarily concentrated on the periphery of existing urban centres. Although more diffused urbanisation of the rural area will probably take place, the demand for this is fairly small, certainly in comparison with the total scale of the rural area. In this sense, the impact on the size of the area under cultivation will be very small. This area declines by a third of a percentage point each year, and this trend will probably continue. The new policy will mean that agriculture in some parts of the country will be faced with increased 'competition' from other land functions.

Technology

- The Dutch agricultural sector works with a high investment of labour and capital per hectare and thus achieves high productivity levels. This is a continuous development fed by new technical knowledge. The development of knowledge in the field of motors, materials, robots, ICT and biotechnology may not be specific to agriculture, but it is of great importance to the sector. The agricultural cluster has always been good at quickly absorbing new knowledge and adapting it so as to apply it throughout the sector. This is a crucial factor for success in terms of international competition.
- Technology is continually offering new opportunities for responding to changing scarcity ratios, to environmental problems (such as problems associated with pesticides, greenhouse gases, minerals, ammonia and stench) and to existing and new consumer needs. There is far-reaching automation evident in all sectors, with heavy use of ICT and measuring and regulating technology. A number of sectors are showing signs of moving towards robotisation. It is possible that more biotechnological innovations can also be expected in the Netherlands over the next decade.

Prospects

- Although the economic significance of the agricultural sector will remain large, it will nevertheless decrease in relative terms. Those sections of the agro-complex focused on processing and sales, in particular, will become more dependent on foreign raw materials. In addition to the provision of safe food and ornamental products, the sector will also play a more important role as a supplier of 'green' and 'blue' services, energy, and various forms of care and recreation. Although the potential demand for services of this nature would appear to be large in the densely populated Netherlands, its significance for farm incomes will remain relatively limited. The prospects for each of the various sub-complexes are listed in the enclosed summary (p. 20/21).
- The number of agricultural and horticultural farms will continue to decline during the coming years due to increasing productivity, the generally restricted opportunities for further growth in sales, succession problems, and pressures to achieve increases in scale. With an average decline of more than 3% per annum, the number of farms will have decreased to fewer than 60,000 by 2015. This is more than 30% below the almost 84,000 farms in 2004.
- The acreage of agricultural land will continue to decline in the coming years, although the great majority of this land will continue to be used for agricultural purposes. As a result of urbanisation, this decline will be more marked in the west of the Netherlands and the south and east of the country than it will in the north. The horticulture sector will be able to retain its position in the west of the Netherlands. The acreage of arable land will decrease in the north of the Netherlands, since relatively large amounts of the contracting starch potato and sugar beet crops are cultivated in this

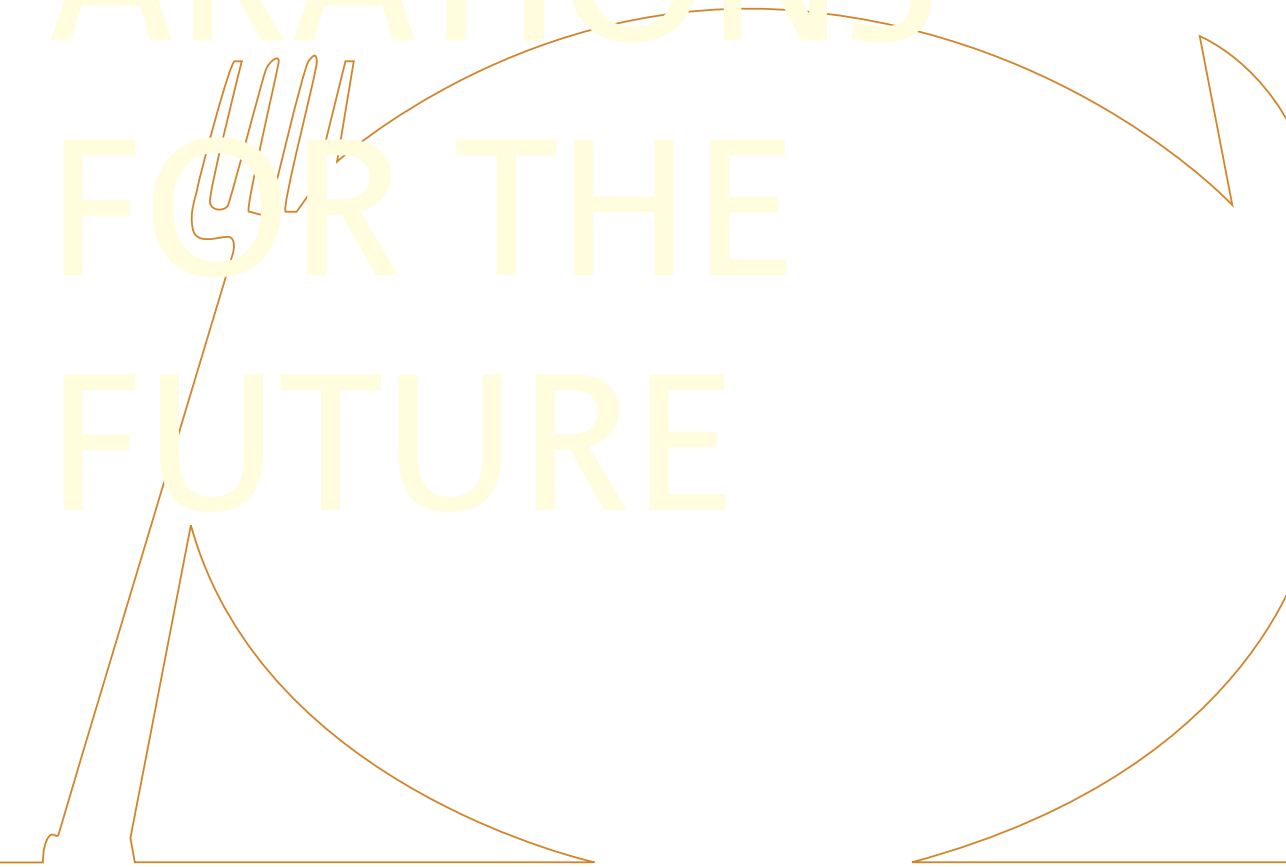
region. The land no longer required for these crops will be taken over by dairy farms. When expressed in terms of the number of cows, the decline in dairy farming is most pronounced in the provinces in the west of the Netherlands. As a result, the share of the other provinces, in particular those in the north of the Netherlands, is increasing. No major shifts are forecast in the location of the intensive livestock farming complex; these farms are concentrated in the south, middle and east of the Netherlands, and this will continue to be the case.

Prospects per sub-complex

Sub-complex	Prospects
Arable farming	– Declining employment; substantial decrease in number of farms – More intensive collaboration in the chain (harvest chains) – Acreage of sugar beet and starch potatoes is declining – Opportunities for growth in sales of seed potatoes – Energy crops not yet profitable: residual products more interesting – Reduction of costs by increases in scale in arable farming areas – Collaboration with other arable or livestock farmers remains an option for the retention of current income levels – Other options: supplementary operations (nature, recreation, wind energy, farm stores, care) or employment outside the farm
Open field horticulture	– Favourable prospects for sales of bulbs and trees – Increased foreign cultivation in the cultivation of vegetables and fruit – Success of new apple varieties of great importance to fruit cultivation – Employment offered by the sector can remain at the current level – Vulnerable to the availability of labour during the harvest – Increases in scale, collaboration within the chain and shortening of the chain – Substantial decline in the number of holdings – Expansion of arboriculture in the current regions of concentration, provided that the regional spatial planning offers the necessary scope
Greenhouse horticulture	– Further growth of the complex inside and outside the Greenports – More intensive collaboration within the chain (knowledge alliances) required – Mushroom sector confronted with increasing competition from Eastern Europe and China – Innovation in the management of production, sales and distribution (such as quality control/assurance and tracking and tracing) – Modified business structures: management/ entrepreneurship and ownership respectively in different hands – Number of greenhouse horticulture holdings decreasing: average area of glass grows to 2.5 hectares – Further growth in number of large holdings

Pasture-based livestock farming	– Increases in scale and declining employment in processing and sales – Differentiation strategy to retain and/or expand market positions. – A degree of relocation to arable-farming areas – Fewer cows in fields; more horses – Farm results under pressure as a result of liberalisation and CAP reforms – High price of quotas is an indicator of confidence, but also an impediment to restructuring – Continuing increases in scale focused on cost-price reductions; number of farms will decline substantially – 'Green' and ' blue' services as supplementary source of income
Intensive livestock farming	– Variable prospects for the different sub-sectors: from a slight decrease (of broilers) to possibly even a slight increase (veal calves). – More competition from countries outside the EU – Declining employment – Enhanced harmonisation in the chain focused on fresh and processed high-quality products is intended to improve the position with respect to consumers and the retail trade – Reduction of losses in the chain by improved harmonisation within the chain – Major differences in farm results promote restructuring – Continuing increases in scale focused on reduction of cost price; substantial decline in number of farms – Few opportunities for diversification; supplementation of incomes by employment away from the farm and the valorisation of energy and heat using co-fermentation

KNOWLEDGE FOR TRANS-PARENT PREP-ARATIONS FOR THE FUTURE



Chapter 1

Introduction

1.1 Project description

1.1.1 Objective

The objective of this report is to present a realistic impression of the prospects for the agricultural sector in the Netherlands in the medium term (up to 2015). The agricultural sector comprises the entire agro-complex: both the primary sector (agriculture and horticulture) and the related activities. It is not possible to give an exact prediction of the scale and structure of the sector in 2015. These factors will of course be dependent on the choices made by the industry and the government in response to the changing circumstances. The objective is therefore rather to give an impression of possible developments and of a number of driving forces that are expected to influence those developments in the coming years. The intention of this is to offer the parties concerned an informative framework in preparing for and taking decisions regarding the coming years.

1.1.2 Demarcation

One section of the Dutch agro-complex is primarily based on foreign raw materials (such as coffee, tea, cocoa, tobacco and tropical fruit). However, the section occupying the spotlight in this research is the section that is based on domestic raw materials. Five sub-complexes can be distinguished:

- The arable farming complex
- The open field horticulture complex
- The greenhouse horticulture complex (including mushrooms)
- The pasture-based livestock farming complex
- The intensive livestock farming complex

This subdivision does some justice to the great diversity within the agricultural sector. Where necessary, we will look at important differences within the sub-complexes.

1.1.3 Working method

The research comprised three steps (see figure 1.1).

1. The sketching of the initial situation of the agricultural sector. This sketch is based on recent general publications by LEI such as the *Landbouw-Economisch Bericht* (Agricultural Economic Report), *Duurzame landbouw in beeld* (A view of sustainable agriculture) and *De Nederlandse landbouw op het Europese scorebord* (Dutch agriculture on the European scoreboard).
2. Analyses of the driving forces for developments in the coming years. To this end, memoranda have been written on the following:

- Development of retail markets and changing consumer preferences

Figure 1.1

Steps within the research

1. Current position

Literature research on the current economic position of Dutch agriculture and the agricultural sector.

Attention devoted to the strengths and weaknesses of the sub-complexes, particularly within the European field of influence.

2. Driving forces

Analysis of the driving forces distinguished: demand, supply and policy.

Attention devoted to the consequences of each of these forces for the various sub-complexes.

3. Prospects

Exploration of the implications for the agro-complex, agriculture and horticulture, and the distinguished sub-complexes.

Assumptions regarding the social context, the general economic development and the relevant international policy. These assumptions are agreed upon with the client.

- Liberalisation, European integration, reforms to the EU's Common Agricultural Policy
- Urbanisation of the Netherlands
- Social acceptance (accumulation and execution of policy)
- Chain development and the structure of the primary sector
- Technological developments
- Demand for new services: opportunities for diversification

3. Exploration of the meaning of these forces (and the combination of these forces) for the future of the Dutch agricultural cluster. For this purpose, a reference scenario was developed for the sector, both as a whole and for the sub-complexes. Attention is also devoted separately to the sensitivity of the outcomes to certain policy assumptions.

In the development of the reference scenario, use was made of data from the World Bank, for example, and of OECD and FAPRI projections. Model calculations with the aid of GTAP and AGMEMOD provided input for other LEI models such as the Input-output model, DRAM and Hortus. The outcomes are harmonised together with experts per sub-complex.

1.1.4 Organisation

The research was carried out by researchers at Wageningen UR (in particular LEI and Alterra). The draft memoranda were supplied in the course of the first half of 2005. The interim results were discussed with representatives of the Ministry of Agriculture, Nature and Food Quality, who prepared the Cabinet's The Choice for Agriculture. In this tailoring, particular attention was devoted to the starting points of the reference scenario for the exploration. In the preparation of the report, use was also made of the results of the Zachariasse working group at Wageningen UR. This working group compiled the draft memorandum on technological developments and, moreover, convened meetings on the sub-complexes and a number of special themes.

1.2 Background

Cognisance was taken of such publications as the CPB publication *Vier vergezichten op Nederland: Productie, arbeid en sectorstructuur in vier scenario's tot 2040* (Four Futures of the Netherlands: production, labour and sector structure in four scenarios until the year 2040) and the EURURALIS project by way of a backdrop to this research. Both documents build upon the CPB's previously published study *Four Futures of Europe*, in which possible futuristic views of Europe are described.
The CPB scenarios centre around two key uncertainties. The first is the extent to which countries are willing and able to collaborate on an international level. The second key uncertainty is the division between public and private responsibilities, and particularly the question of how the choice was made for reforms (liberalisation) of the collective sector.
In the 'Regional Communities' scenario, many countries attach a great

deal of value to their sovereignty and identity; the current government policy will be maintained. In 'Strong Europe,' attention is devoted to international cooperation, particularly in the field of the environment. Limited reforms are taking place in social security. 'Transatlantic Market' is characterised by strong reforms of the collective sector. In this scenario, however, the European countries are not prepared to surrender part of their sovereignty. The 'Global Economy' scenario combines international cooperation with thorough reforms of the collective sector.
In the CPB publication, possible developments for the Dutch economy are presented at macro and industry-sector levels as far as the year 2040. The analysis led to the following conclusions, amongst others:

- The economic growth can vary strongly. For example, the GDP per capita of the population in 2040 is between 30% and 120% higher than the current level. High growth rates are only one side of the coin, however. The scenarios with higher growth rates also have greater differences between incomes and relatively little attention for the environment.
- The division of employment across industry sectors will continue to shift strongly, particularly from agriculture and industry to services and care. This process has been taking place for decades.

Taking the four CPB scenarios as a basis, the EURURALIS team at Wageningen UR and the RIVM mapped out various sustainability aspects of rural areas in 2030. The IPCC (Intergovernmental Panel on Climate Change) scenarios are also involved in this. Within EURURALIS, the focus was not so much on creating a blueprint for the future, but on gaining insight into 'imaginable' scenarios (figure 1.2).

Agriculture appears to hold its own

Agriculture appears to hold its own: the land in rural areas retains its main agricultural function. Even in the Global Economy scenario, in which the protection of borders and domestic support are completely abolished, European agriculture manages to maintain its position. In the first place, this is due to the development of demand. In 2030, almost eight billion people will need to be fed. Moreover, the increasing prosperity (which grows the fastest in this scenario) will result more animal proteins being consumed, particularly in developing countries.
In the second place, the recent reforms to the Common Agricultural Policy – in which price support is converted into direct income support – have helped prepare European agriculture for international competition. While it is true to say that the reforms have had a major impact on incomes, the production and trading effects remain limited. Incidentally, the latter point means that the intended advantages of liberalisation will remain limited for developing countries in practice.
One drawback to the Global Economy scenario is the increasing pressure on the environment, which could ultimately also put the provision of food at risk due to shortages of water and available land, and climate change.

Figure 1.2

four world views in EURURALIS

In this world view, there is great confidence that technological solutions will be found in time.
Even with all this, European agriculture will still have to face some difficult times. The restructuring of agriculture will take place irrespective of the scenario. Only the speed and the way in which this will happen will vary per scenario. In the global scenarios, sugar production will largely disappear from Europe, whereas grain production will remain stable. In some regions, the trends of the concentration of production and intensification will continue strongly, and agriculture will disappear in marginal areas. In one region, this will lead to a loss of biodiversity, while in another region it will lead to a loss of quality of life.
Incomes from agriculture will also decline, leading to further increases in scale, more part-time farming and less employment. Agricultural incomes retain the best position in the Continental Markets scenario, and scale increases are less dominant. In all scenarios, however, the share of agriculture in the economy and employment declines. In rural areas, too, the relative importance of agricultural activities declines still further and the vitality is determined more by other sectors.

The selected world view
In view of the problem and the relative proximity of the horizon of the present research, the decision was taken not to fully elaborate all four scenarios for the Dutch agro-complex. Instead, a number of plausible medium-term elements were chosen from the various world views to serve as starting points.
With regards to the international world order, a further globalisation of trade is assumed, i.e. a continuation of the current WTO line. On the global stage, a number of 'new' players will gain a more important role, such as China, India, Russia and Brazil.
With regards to government policy, the further withdrawal of the government is assumed, particularly in the richer countries. The role of governments will shift from care provision to support provision. This means a greater emphasis on economic efficiency (profit, for which private actors are gaining increasing responsibility) and a reduced emphasis on social and ecological dimensions (people and planet).

1.3 Structure of the report
The main text of the report consists of two parts.

Part 1 – Chapters 2 to 4 inclusive – describes the position, driving forces and prospects of the agricultural sector as whole. Chapter 2 outlines the current position of the Dutch agricultural sector (within a European context, too) based on the developments over recent decades. Chapter 3 analyses the driving forces with an eye to the future developments in the sector, focusing on the demand for agricultural products, the agricultural and trade policies (EU and WTO), environmental policy, urbanisation and

technological developments. Chapter 4 gives an overview of the expected developments within the agricultural sector and its sub-complexes in the coming years, up to 2015. With reference to the reference scenario, the policy sensitivity of the developments is considered. The opportunities for alternative functions are also examined, as are the consequences for the landscape.

The developments per separate sub-complex are further discussed and elaborated in part 2. Analogous to the structure of part I, the chapters include an overview of the current position, an analysis of the driving forces and a consideration of their significance for the prospects of the sub-complex.

Ruthger Steenbeek (born 1958) is currently winding down the fruit-growing business that he and his wife Bettie used to run just outside Biddinghuizen in the Flevo polder. With their two children, they are moving to a house in the village. They had a 16-hectare farm and leased another 10 hectares of apple orchards from a neighbour. Ruthger was on the boards of the Netherlands Fruit Growers Association (NFO) and the Fruitmasters auction centre. He now works for *LTO Noord Advies*, an agricultural consultancy firm. Initially, he advised farmers who were terminating their operations; he is now a strategic business consultant. Earlier this year, he organised a series of meetings for people who were pulling out of farming. Instead of just the 30 who were expected, 300 farmers turned up.

Helma van der Heijden-van Driel (born 1968) and her husband Robert run a pig farm in Dinther, just outside Vorstenbosch (North Brabant). Their farm, BV Heijderhoeve (a limited company), is on two different sites. It is a closed pig farm with 1000 rearing sows and porkers. There are five employees, some of them part-timers. Helma has set up websites for pig farmers and for customised Internet greeting cards that make comical references to pig farming. Both activities help improve the image of the sector and, in 2002, the business was selected (from 2000 candidates) to receive the entrepreneurship prize presented by the Bernheze Lions Club.

Brord Sloot (born 1966) has a dairy farm – De Vinkenhorst – in Herwen in the province of Gelderland, close to the German border. He has 40 hectares of grassland, 10 hectares of fodder maize and 2.5 hectares of alfalfa. His 70 dairy cows enable him to fill his milk quota of 571,000 kg. He also has 70 followers.

Brord Sloot employs a part-time assistant on a fixed contract for three days a week. Along with ten other dairy farmers, he is involved in the 'Smile, Caring Dairy Products' project (Smile, *Zuivel met Zorg*) and will soon be supplying milk to make the world-famous Ben & Jerry's ice cream.

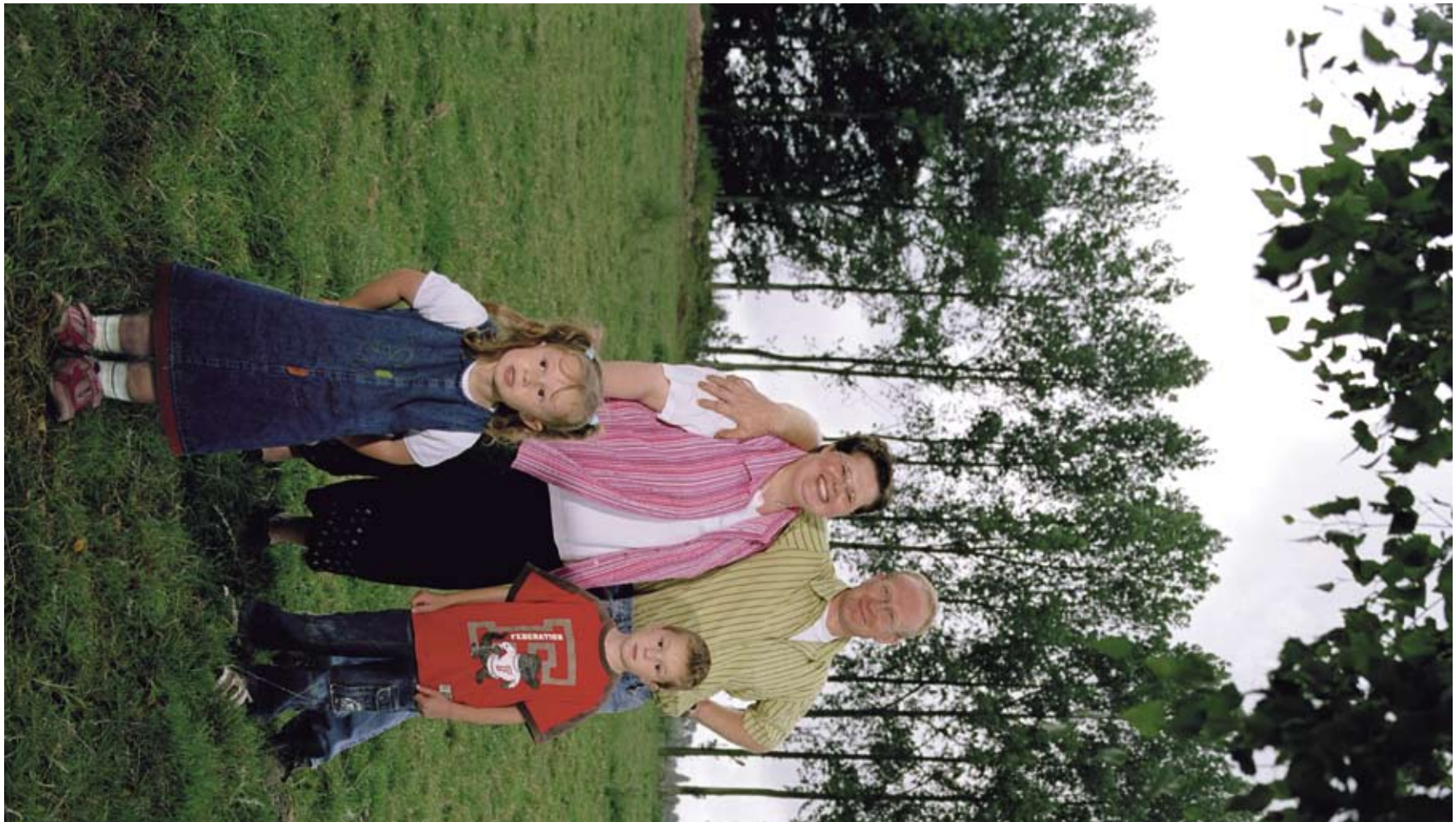
Zuurbier & Co. is a firm of rose growers who have been producing cut roses for more than 35 years. The owners are Cor Zuurbier and Kees Oudhuis, and they have now been joined by Cor's daughters Judith and Rosaline and Kees's son Wim. The farm is based in Heerhugowaard (north of Amsterdam) and produces 60 million flowers a year. That makes it one of the biggest rose producers in the country. After expanding its nurseries in the Netherlands, the firm started an operation in Kenya in 2001, growing not just roses but also summer flowers. Later this year, it will also be opening a summer flowers nursery in Ethiopia.

Jan Uijttewaal (born 1962) recently moved from Houten to a clayey river delta property in Horssen (Gelderland), where he runs a 50-hectare dairy farm with 80 dairy cows, 60 followers and a milk quota of 750,000 kg. He hopes to eventually expand his quota to 1 million kg. He has been using a milking robot since 2001. Jan Uijttewaal is on the Executive Board/Supervisory Board of Campina, an international dairy produce cooperative.

Dyanne Schrauwen (born 1968) is one of the partners in a 240-hectare organic arable and field vegetable farm in Langeweg (West Brabant). With two other farmers, she has set up a general partnership (VOF) called Biotrio De Nieuwe Weg (New Way Biotrio). The partnership grows mainly spinach, winter carrots, beans, potatoes and onions, each crop taking up 30 to 40 hectares.


FENDT

Jan and Marianne Moonen moved from the Dutch province of North Brabant to France ten years ago. With their four children, they live on a 300-hectare arable farm in the little country village of Heberville in Normandy, running it with a staff of seven. They use 120 hectares to grow seed potatoes, making this the biggest seed potato farm in France. They also grow flax, sugarbeet, dry-harvested peas and wheat.



Cors Onnes and Wilma van Linge have a 120-hectare arable farm at Finsterwolde in the province of Groningen, with crops including wheat, spring barley, Italian ryegrass, alfalfa and sugar beet. Some 46 hectares of the farm are also given over to field and meadow bird management and more than 9 hectares consists of field margins sown with wildflowers, forming an ideal shelter and nesting site for birds.

Many years ago, two new barns were built to house 75,000 broilers. That was the first stage of diversification for Cors and Wilma and it was recently joined by an art gallery – with a teashop and sculpture garden – representing yet another new departure.

The brothers Cees and Leo van der Lans grow and package tomatoes, mainly vine tomatoes and large plum tomatoes. Their holding has about 43 hectares under glass at three locations in Maasland, in 's Gravenzande and in Rilland. In Rilland, they are building a closed-cycle 1.5-hectare greenhouse that will use residual heat, meaning a 30% cut in energy costs and more than 20% higher production. Cees and Leo employ 50 permanent staff and take between 120 and 150 'temps' and secondary-school pupils during the busiest period of the year. The Van der Lans brothers are members of the 'Action Pearl Growers' association, which has a tomato production facility in Spain. They hold a 50% share in Greenpack Holland in De Lier.

Wytze de Vries (born 1961) comes from Kortwoude in Friesland (near the border with the province of Groningen). He and his wife have a commercial partnership, with dairy cows, broiler (meat) chickens and nature management areas. They have 30,000 broilers, 80 dairy cows, 50 followers and a milk quota of 600,000 kg. Their farm covers an area of 62 hectares; 8 hectares of this is used to grow maize and the rest is grassland. They have one part-time employee. They are also engaged in field-margin and meadow management, construct fencing, and manage 12 kilometres of belts of alder trees. The farmers in the area where they live have set up a nature and landscape management association (*Vereniging voor Agrarisch Natuur- en Landschapsbeheer in Achtkarspelen, Vanla*).

Part 1 General

AGRICULTURAL HOLDINGS ARE INCREASINGLY BECOMING PART OF INTERNATIONAL CHAINS

Chapter 2

Current position of the agricultural sector

2.1 Introduction

This chapter provides an overview of the Dutch agricultural sector. Following an outline of a number of strengths and weaknesses, an impression is given of the international position (based on trade figures) and of the position within the national economy (in terms of added value, employment, usage of space and the environment). After that, we look at the structure of the agricultural industrial column and at changes that have taken place within the primary sector over the last few decades. Lastly, attention is devoted to the development of agricultural and horticultural holdings and to possible alternative sources of income for farmers and growers.

2.2 Position within the economy

2.2.1 General

In many respects, the Dutch agricultural sector has an excellent starting position. The geographical situation and physical conditions are very favourable. The Netherlands is flat with fertile soil and few obstructions, a moderate climate and a lot of light. There is a good agricultural infrastructure, including for example the port of Rotterdam for the supply of raw materials (primarily for livestock production) and a good network of gas pipes (for greenhouse horticulture). Lastly, the professional skill and level of expertise of the farmers and horticulturalists is relatively high. From the point of view of sales, the sector benefits from the proximity of over 450 million consumers with great purchasing power (the EU 25), who are easy to reach thanks to good logistical connections. Within this European market, trade can generally take place in the same currency as the domestic market and there are no veterinary or phytosanitary obstructions that could impede sales. Approximately 80% of agricultural exports therefore remain within the EU.

At the same time, the position of the sector is also vulnerable. With 16 million inhabitants sharing 34,000 km^2, the Netherlands has the second highest population density in Europe: 452 people per km^2. A city is always close by in the Netherlands. This means that relatively high demands are made of the agricultural sector. Examples include the discussion on lighting in greenhouse horticulture, or the smell from pig farms. Moreover, the scarcity of land gives rise to relatively high land prices. This limits the relocation possibilities if a holding is having problems in a particular area. More generally, high land prices virtually force farmers into more intensive forms of farming.

2.2.2 International trade

Together with the United States and France, the Netherlands is one of the world's largest net exporters of agricultural products and foodstuffs. This can be considered quite remarkable in view of the country's small size and high population density.

Altogether, ornamental products, meat, dairy products and vegetables account for almost 75% of the net exports (figure 2.1). Dutch exports comprise primarily high quality products. The exports from the United States are mainly arable products like grain and oilseed, for which the Netherlands is a net importer. France occupies a middle position with wine, cheese and grain as its most important export products.

Approximately 80% of Dutch exports remains within the EU, with Germany as the most important destination by far. Germany is also the largest importer of agricultural products in the world. Other important destinations within the EU include France, Belgium/Luxemburg, the United Kingdom and Italy. The United States, Russia, Japan and Switzerland are the most important non-EU buyers.

Competitiveness is the capacity of holdings and sectors to maintain and expand their market position. This cannot be described in terms of one simple indicator. The availability of production factors is important, as is the expertise and the skills to deploy those production factors in such a way that the advantage over the competitors is maintained. Entrepreneurship and management qualities play a role, as do climatological conditions, the development of international demand, government policy, the performance of the institutions, etc. The efficient organisation of production and sales is of undoubted importance in terms of the agricultural sector as a whole: the whole chain of primary agriculture right through to processing, trade and transport.

In primary production, both the 'industrial productivity' and the 'land productivity' in the Netherlands are at a high level, higher than the average for Western Europe. That productivity is also important to be able to compete within the Dutch economy bearing in mind the relatively scarce (and expensive) production factors of labour and land. Innovation and keeping ahead of the rest with knowledge-intensive and high-quality products remain important in order to compensate for the abovementioned competitive disadvantage.

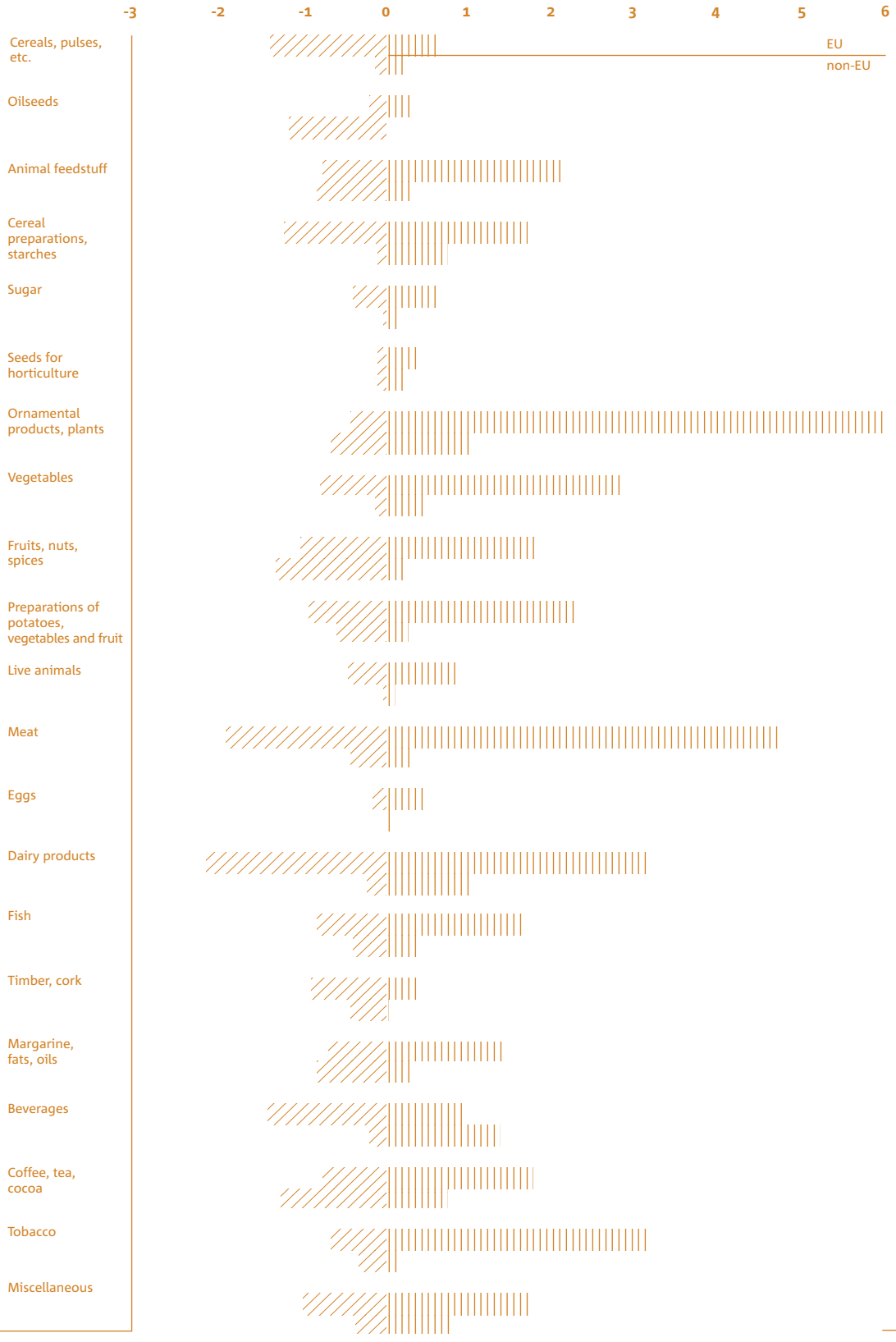
Significance of the euro
The euro – currently the common unit of currency for 12 countries – is important for the internationally operating agricultural sector. Thanks to the euro, trade between these countries is no longer hindered by the need to recalculate prices and costs in a different currency, thus saving on transaction costs. The euro has also removed the risk of the currency values shifting from one moment to the next. The actual introduction of the euro in 2002 brought about a period of temporary inflation, partly due to the costs of the introduction. Since the United Kingdom, Denmark, Sweden and the countries that acceded in 2004 are still using their own currencies, rather than switching to the euro, trade with those countries involves currency risks, like the risks also involved in trading with other countries, where the American dollar is often used as a currency unit. As of 2002, the euro also rose sharply in value compared with the dollar: in May 2005, the euro exchange rate was about 12% higher than the initial exchange rate of January 1999. The expensive euro is unfavourable for agricultural exports to non-euro countries.

Although the Dutch agricultural sector still occupies a strong position within Europe (figure 2.2), this position is starting to crumble away in relation to some countries. Agricultural exports thus grew at the same rate as the EU average over the last decade, but that growth lagged behind that of Germany, Italy and Spain. Spain therefore gained ground in the European vegetable market, at the expense of the Netherlands. Within the pork products market, Denmark – traditionally the largest competitor – reinforced its position. Within the dairy market, the Netherlands lost some ground to Germany, France and Denmark. And even before the outbreak of fowl plague in 2002, the Dutch poultry sector was no longer able to keep up with the high rate of growth of exports from Germany, Italy and France in particular. In addition, imports of poultry meat increased from Brazil, Thailand (until also struck by fowl plague in 2004), Poland and Hungary. For potatoes – increasingly in the form of processed products – the Netherlands has relinquished its position to Belgium, France and Germany. With regard to ornamental products, the Netherlands remained the undisputed market leader, partly due to its central trading role.
In terms of investments, too, the international orientation of the Dutch agrocomplex is great. The direct foreign investments began to grow in strength in 1995 and totalled around 30 billion euro in recent years. Most investments take place within the EU. In addition there is a lot of interest in the United States and in the region of Eastern Europe (see also 2.3.2).

2.2.3 Added value and employment
The significance of the agricultural sector for the Dutch economy as a whole is considerable. For example, the complex of supply, production, processing and sales of agricultural product totals around 650,000 jobs, approximately 10% of the national total. This share is gradually declining (table 2.1).

Figure 2.1

Composition of Dutch agricultural imports and exports with the EU 25 and with other countries, average value of the years 2003 and 2004, x billion euro
Source: Statistics Netherlands (CBS), processed by LEI.


-3
-2
-1
0
1
2
3
4
5
6
EU
non-EU
Cereals, pulses, etc.
Oilseeds
Animal feedstuff
Cereal preparations, starches
Sugar
Seeds for horticulture
Ornamental products, plants
Vegetables
Fruits, nuts, spices
Preparations of potatoes, vegetables and fruit
Live animals
Meat
Eggs
Dairy products
Fish
Timber, cork
Margarine, fats, oils
Beverages
Coffee, tea, cocoa
Tobacco
Miscellaneous

From 1995 to 2003, the gross added value of the Dutch agro-complex rose from 32.3 to 41.8 billion euro. The share in the national total declined from 12% to just over 10% during this period. The Dutch economy as a whole therefore grew faster than the agro-complex. Part of this difference resulted from the lagging prices in the agricultural sector. Incidentally, almost 40% of the added value of the agricultural complex concerns foreign raw materials. Two-thirds of the added value and employment is related to exports.

2.2.4 Use of space

In recent research into the rural economy of the Netherlands, 40 regions were distinguished according to population density, ranging from strongly urbanised (more than 1,000 inhabitants per km^2), to urbanised (300 to 1000 inhabitants per km^2) and less urbanised (less than 300 inhabitants per km^2). The national average amounts to 452 inhabitants per km^2.
The social-economic development in these regions did not appear to vary very much in recent years. There are therefore no major differences in the distribution and development of employment. Only a few areas have a relatively low degree of participation and high levels of unemployment: East Groningen, South-west Drenthe, Zeeland Flanders and South Limburg.
The agricultural sector takes up approximately 56% of the land in the Netherlands (see table 2.2). This equates to two-thirds of the total land surface. The area of cultivated land has declined since 1990 by 4% to just over 1.9 million hectares in 2004. Grassland and arable crops account for the largest share of this area by far, with 986,000 hectares and 820,000 hectares respectively. Horticultural crops account for 117,000 hectares, 11,000 hectares of which are under glass. The share of horticulture in this is around 6%, compared with approximately 4% in 1950. The total area of horticulture has not grown any further since 1980.

2.2.5 Environment

The impact on the environment caused by agriculture and horticulture is gradually becoming less, although the rate of this decline does appear to have slowed over recent years, and it will be some time yet before the final objectives for certain environmental aspects are achieved. Due to the composition of the production package in particular – a relatively large amount of horticulture and a lot of intensive livestock production – the environmental impact resulting from the Dutch agricultural sector is higher than in most other countries. The use of chemical pesticides per hectare in the Netherlands is approximately 2.5 times as great as the average in the EU 15 and the loss of nitrogen is 3 to 4 times as great. Due to the high yields per hectare, however, the environmental impact per product unit in the Netherlands is much lower than it is elsewhere.
The use of chemical pesticides almost halved between 1985 and 2000, but has hovered around the 9.5 million kg mark since that time. There are major differences between the various crops regarding the use of agents. Between 3 and 5 kg per hectare is generally used for grain and sugar beet;

Figure 2.2

Most important countries of origin for agricultural imports (in billion euros) in the EU, 1995-2004
Source: Eurostat.

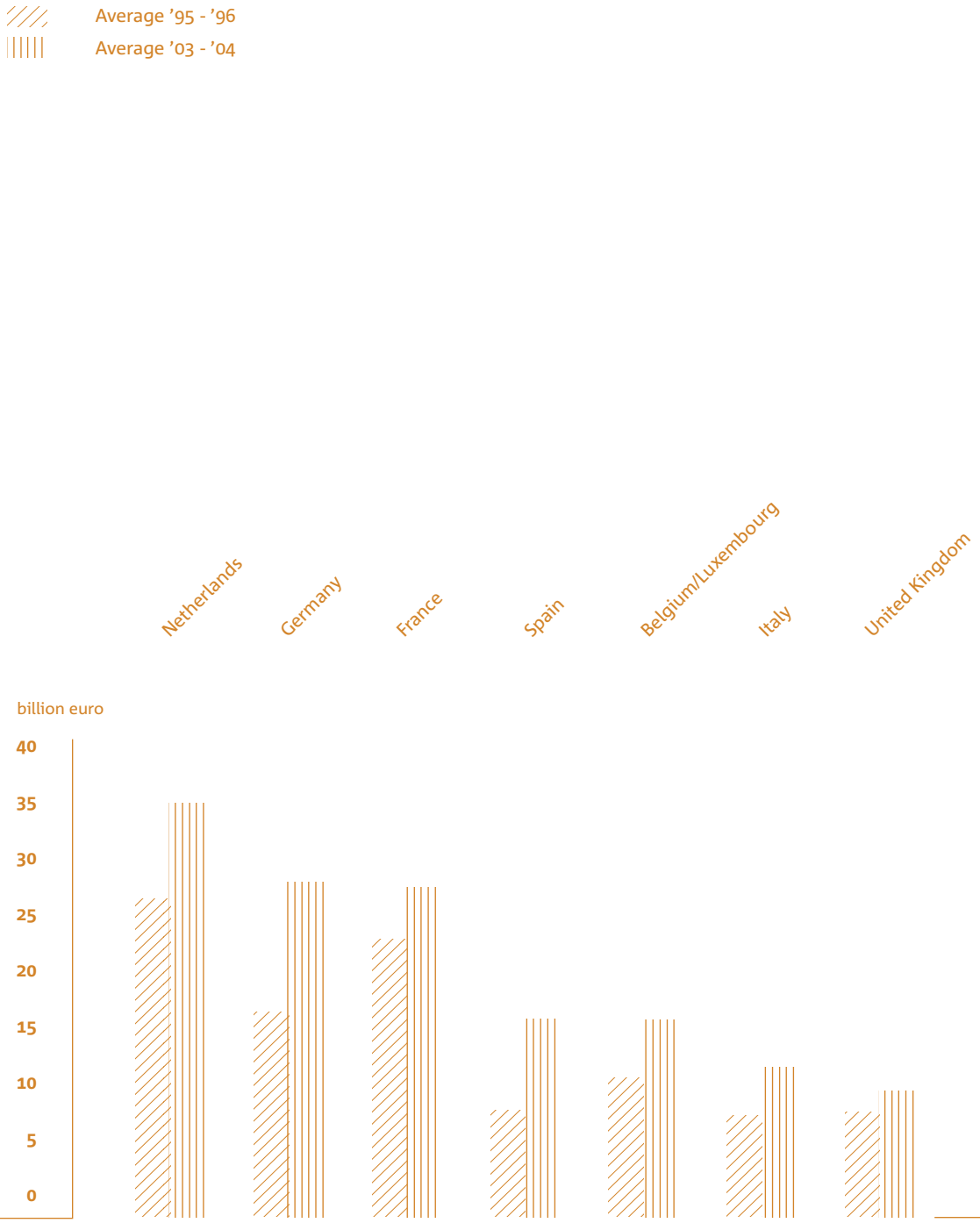


Table 2.1

Key figures of the Dutch agro-complex, 1995 and 2003

	Added value (factor costs, x billion euro)		Employment (x 1,000 working years)	
	1995	**2003 (p)**	**1995**	**2003 (p)**
Agro-complex total [a]	32.3	41.8	659	650
Share in national total (%)	12.0	10.6	11.6	10.1
Horticulturists, agricultural services and forestry	1.0	1.7	39	43
Processing, delivery and distribution of foreign agricultural raw materials	11.1	16.3	190	211
Agro-complex, on the basis of domestic agricultural raw materials	20.2	23.6	430	397
Share in national total (%)	7.5	5.9	7.6	6,2
Distribution	2.3	3.1	53	56
Processing	3.0	4.9	54	41
Delivery	6.5	7.6	135	122
Primary production	8.4	8.1	189	168

a) Based on domestic and foreign agricultural raw materials; including the horticultural sector, agricultural services, forestry, cocoa, beverages and tobacco.
Source: Agricultural input-output table, processed by LEI.

Table 2.2

Use of space (%) in the Netherlands according to groups of regions, 2002

Region	Built-up, traffic, infra-structure	Inland waterways	Water	Nature/ forest	Agriculture	Total
The Netherlands	14	9	10	12	56	100
Strongly urbanised regions	30	15	5	9	41	100
Urbanised regions	16	6	4	16	58	100
Less urbanised regions	8	10	17	9	57	100

Source: Terluin et al. (2005).

for potatoes, onions, vegetables and fruit, between 10 and 20 kg is used; and for ornamental crops, between 20 and 60 kg.
The emissions of greenhouse gases from agriculture and horticulture, measured in CO_2 equivalents, have fallen by over 20% since 1990 – the reference year for the Kyoto Protocol, which became effective at the start of 2005. Roughly speaking, these emissions consist of a little less than one third CO_2, one-third methane and a little more than one third N_2O (nitrous oxide, also known as laughing gas). The last two gases – methane and nitrous oxide – are released mainly in the livestock production, and their emissions have also greatly declined over the last few years. Most of the emissions of CO_2 can be accounted for by greenhouse horticulture. The energy efficiency of greenhouse horticulture is also increasing.
Emissions of phosphates and nitrogen from the agricultural sector have been declining since the 1980s (table 2.3). The supply of animal manure is declining due to the shrinking of the livestock population, while the use of artificial fertiliser is also falling, partly due to the manure policy. The ammonia emissions from the Dutch livestock population have almost halved since the mid 1980s.
With more than 10 million tonnes of waste per year, the food industry has a large share in the national waste production figures: around 15 to 20%. After correction for recycling, this figure is still over 10%. Around 90% of the waste from this sector is in fact recycled, whereas the national average is less than 80%.
The share of the whole food industry in the national water consumption is proportional to its share in the rest of the economy, despite the presence of very large users such as the dairy industry.
Just as is the case in greenhouse horticulture, the emissions of greenhouse gases by the food industry have been reduced, mainly through improvements in energy efficiency.
The net environmental costs for the food industry amount to approximately 2% of the gross added value, compared with around 2.5% for the industry as a whole. Within primary agriculture and horticulture, this figure is 6 to 7%.
The entire agro-complex demands a considerable transport performance. A quarter of all domestic goods transportation is linked with the agro-complex.

2.3 Agricultural industrial chain

2.3.1 Distribution

Within the sales of foodstuffs through retailers, the share of the chain stores (supermarket chains) has grown continuously to around 82%.
A particularly large proportion of potatoes, vegetables, fruit, cheese and eggs are sold through the supermarket channel. The share of the smaller, independent shops and specialised shops has therefore declined significantly – drastically, in fact, over the last few years. The hotel, restaurant and catering sectors occupies a unique position within sales, with these sectors together accounting for about 25% of consumer expenditure on food and beverages.

Table 2.3

Nitrogen and phosphate equilibrium in Dutch cultivated land, 1970-2003

	1970	1980	1990	2000	2003(p)
(kg N/hectare)					
Input, total	332	447	459	394	343
of which					
animal manure	133	190	239	205	177
fertiliser	185	240	201	169	147
Output	167	210	248	212	198
Difference between input and output	165	237	211	182	145
Ditto, index 1970=100	100	144	128	110	88
(kg P_2O_5/hectare)					
Input, total	135	160	153	125	104
of which					
animal manure	80	115	108	87	72
fertiliser	50	39	37	32	27
Output	50	66	71	68	64
Difference between input and output	85	94	82	57	40
Ditto, index 1970=100	100	111	96	67	47

p: provisional
Source: RIVM/CBS.

Price competition

There are a limited number of large supermarket chains. Just a few supermarket concerns (Ahold, Laurus, Schuitema, Albrecht and the Sperwer Group) accounted for a combined market share of over 70% in 2002. In principle, this indicates a strong market position (both on the sales side and on the purchasing side).

However, partly due to internationalisation, there is a lot of competition, for example from 'discounters' like Aldi and Lidl, which target price-conscious consumers. Since the autumn of 2003, this has been expressed in a direct price war in the retail sector. This competitiveness between retailers limits the sales power of the individual retail chains. For this reason, attempts are made to make use of the purchasing power – the ability to purchase at a lower price in order to assure the margins. Depending on the product, stores can also turn to foreign suppliers. One aspect of this strategy is that many supermarket chains gave their own brands a more prominent position

than the so-called top brands of the foodstuffs concerns. It is more difficult for supermark et chains to modify the prices of the top brand products unilaterally.
Bunte et al. (2003) see no need for stricter competition policy, since there are as yet no major indications of any misuse of power by chain stores.
In cases of mergers and takeovers, food concerns face a choice between maintaining the broad range that they have evolved, or reorganising. Partly due to the costs of maintaining separate brands (promotions and the like), concerns like Unilever and Heineken decided to get rid of some of their brand names.
One can view this decision as a symptom of the balance of power in the chain: a response to the strategy of retail chains to reserve less space on the shelves for the top brands, thus leaving more room for their own brands. On the other hand, the foodstuffs industry brings many new products onto the market every year, often with a short life cycle. This appears to be necessary for a business to maintain its market share.
If the top brands lose sales opportunities, this can influence price setting and the added value in early sections of the chain, including primary agriculture. Incidentally, in the Netherlands, the top brands' share in the turnover of the supermarkets has long been around 70% compared with approximately 20% for the own brands. In other EU countries, with the exception of Italy, own brands have had a larger market share for longer.

Hotels, restaurants and catering
In 2004, consumers in hotels, restaurants, bars and similar establishments spent € 10.5 billion on food and beverages (table 2.4). This makes up almost 25% of the total spending on food and beverages; in recent years, this share has been declining slightly. Of the total expenditure in hotels, restaurants, bars etc, € 5.9 billion was spent on meals and catering, and over € 4.5 billion on beverages. Snack bars are losing ground to tearooms and fast food restaurants. McDonald's and Burger King are the most important exponents within the latter category. The provision of meals in cafés, pubs and hotels is rising, although the number of cafés and pubs is declining.
The hotel, restaurant and catering sectors are becoming more and more diverse. For example, a number of larger bookshops in the Netherlands have added a coffee bar serving food as well. The foodstuffs industry is also making its way into the field of catering. Following the opening of Bertolli lunch cafés and a Unox shop, Unilever and the supermarket chain Sperwer collaborated to develop a café concept called Café Plus. So-called wok restaurants – where unlimited individualised dishes can be prepared for a fixed price – are also experiencing a boom.

Driving for quality
Price reductions and a greater emphasis on own brands within the supermarkets appear to point to the necessity of such reductions in prices and cost prices. However, there are also indications pointing in a different direction,

Table 2.4

Expenditure on food and beverages (in billion euro) in the hotel, restaurant and catering sectors in the Netherlands, 2001-2004

	2001	2002	2003	2004
Consumer expenditure in the hotel, restaurant and catering sectors	10,579	10,832	10,581	10,469
Ditto, as a percentage of the total expenditure on food and beverages (%)	26.1	25.8	25.0	24.6

Source: CBS Statline, processed by LEI.

particularly within the sphere of corporate social responsibility, which can be translated into farming terms as an appeal for environmentally-friendly and animal-friendly production methods and guaranteed food safety. Chains are showing an increasing tendency to make demands (of the product and the production process) in this vein, going above and beyond the statutory requirements such as HACCP. Incidentally, initiatives in this respect are based not only on retail trade (international or otherwise), but also the processing industries and for example agricultural organisations (statutory or otherwise). Endless examples could be given: environmental quality marks (such as *Milieu Programma Sierteelt*, MPS), Chain Quality Milk (KKM, *Keten-Kwaliteit Melk*, initially for the whole sector, now per holding), the veal calf quality guarantee foundation (*Stichting Kwaliteitsgarantie Kalversector*, SKV), Total Chain Monitoring (*Integrale Keten Bewaking*, IKB, for various types of animals, coordinated by the commodity board), Good Manufacturing Practices (GMP, which are followed by many food companies and animal feed manufacturers), the Association for Certification of Alternative Agriculture (*Stichting Keurmerk Alternatieve Landbouw*, SKAL, which sets rules for organic farming), etc. In all these systems, certificates are awarded by organisations that have been recognised by the Dutch Accreditation Council.

One important example of steering by the retail trade is EurepGap: protocols for Good Agricultural Practice (GAP), drawn up at the initiative of a number of large European retail trade organisations: the Euro-Retailer Produce Working Group (Eurep). This group was first developed in 1999 for (fresh) vegetable-based products, with animal products added at a later date. The core concepts are traceability and justification: producers must be able to demonstrate how the product has been produced, the inputs used etc.

Other than the quality of the products, attention is also paid to animal welfare, the environment, nature and working conditions.
In addition, British retailers (including Tesco, Safeway and Sainsbury's) have formulated the BRC Food Standard, including ISO and HACCP requirements. This standard sets conditions for flower growers in Kenya and Tanzania, for example, and helps speed up the transition towards more animal-friendly housing for Dutch pigs. The German food industry also has its own system with QS (quality and safety), which is further elaborated together with the wholesale and retail trade.
The possibilities offered by ICT – in terms of transparency and quality management too – will have a more far-reaching influence on the requirements set for the primary sector. The investments required for this demand an adequate scale of production. All this will form a new driving force for further increases in scale.
Transport plays an important role within the chain. One in three lorries and one in seven cargo ships transports agricultural products. The good infrastructure of roads, waterways, ports and airports has played a major part in the development and international orientation of the agricultural sector. This underlines the importance of agro-logistics. Traffic congestion in the densely populated Netherlands could become a major impediment to maintaining and further extending this position.

2.3.2 Delivery and processing

The Dutch 'food and beverages industry' is relatively large (with a total of 130,000 working years) and large in scale. In total, there are almost 5,000 holdings with an average of 25 to 30 employees and an average turnover of almost € 10 million. The 255 holdings with more than 100 employees have on average around 350 employees and an average turnover of € 170 million. The total turnover in 2002 amounted to over € 42 billion (see table 2.5).
In relation to other EU countries, the Netherlands occupies a central position in terms of structure. In southern Europe, the sector is smaller in scale, whereas the scale is larger in Germany, France and the UK. It is possible that this is related to the larger domestic markets that these countries have.

Strong concentration in processing

The concentration of the industry means that farmers come into contact with fewer and fewer processing companies. For example, in the dairy sector, there were still 57 companies in 1980, with over 150 factories. In 2002, there were only 12, with 59 factories. Strong concentration is also taking place in slaughterhouses.
In the compound feed industry, five holdings account for over three-quarters of the market. Strong concentration can also be seen in starch potatoes (Avebe) and sugar beet (Cosun and CSM). In both cases, there are only a few processing factories left in the Netherlands. For sugar beet growers, with an eye to the changes in European policy, a decision was recently made to close two factories and to keep three factories operational.

Internationalisation

The Dutch agricultural sector invests a great deal in other countries; as much as € 32 billion in 2001. These investments have grown particularly strongly since 1995. In 2002 and 2003, the extent of these investments declined, possibly as a consequence of the increased international uncertainties. Incidentally, much of these investments take place outside the EU, for example in the United States, Central and South America, the Far East and Russia. Within the EU, the emphasis is placed on the Netherlands' neighbouring countries, Germany and Belgium. In return for these investments in other countries, many smaller investments are made by other countries within the Dutch agricultural sector, for example by Switzerland. In total, these investments amount to about € 15 billion. Growth can be seen here, too, albeit more gradual growth.

All this indicates that the agricultural sector is gaining an increasingly international character. This also means that the relationship between the primary producer and the other partners in the supply chain (delivery, sales and processing) is becoming less and less automatically regional or 'national.' The primary producer has or will have contacts with suppliers and buyers from other countries. These may attach less importance to the origin of the product to be traded or processed than the previous nationally or often regionally-oriented holdings.

Primary production in the Netherlands with and by means of strong processing and trade

The large ornamental plant auctions and trading companies (wholesale and distribution) form a kind of potter's wheel for international ornamental plant cultivation. This also attracts products from other countries, which find their destination via the Netherlands. This central international role goes hand in hand with a sizeable production sector in the Netherlands. All in all, this creates favourable conditions for primary production in the Netherlands and there are no indications that the Dutch ornamental plant complex is losing its market position. The sales of products like tulips, other cut flowers and flowering bulbs, which had increased strongly in preceding years, led to an increase in the demand for bulbs. Bulb cultivation is therefore profiting from the strong position of Dutch ornamental plant cultivation in general. Aside from this, the ornamental plant cluster offers possibilities for investments in new varieties of flowers, pot plants etc, for example.

The Netherlands is the market leader in the breeding, selection and reproduction of starting material for the cultivation of cut flowers and pot plants. The management departments of many companies in these sectors are based in the Netherlands. This does not alter the fact that holdings are often bought up here too, and that the outsourcing of labour intensive work to 'low wage countries' is an option that is being looked into (chrysanthemum cuttings, tissue breeding), whereby management sections and some jobs will disappear. The position of bulb cultivation is very stable and prominent. A factor in this is the fact that bulb cultivation results in both an end product and an intermediary product. On the one hand, bulbs are supplied to consumers for use in the home and garden, while another part of the production ends up on specialised farms, which need the bulbs as initial material for the cultivation of cut flowers (e.g. tulips, lilies, etc).

The processing of potatoes into products like chips and crisps requires a volume that is considerably larger than the Dutch supply. Growers and a number of processing companies have built up a strong cluster over the years. Due to the expansion of potato cultivation in other countries (Belgium, Germany, France and Poland), the optimum location for processing can shift and the conditions for Dutch growers may become less favourable. The expertise and the existing infrastructure in the field of cultivation, storage and processing and the strong position of the Dutch seed potato sector can also be major plus points for the consolidation of the position of the total potato sector.

The fattening of veal calves – to a great extent imported as new-born calves from countries like Germany and Poland – has increased in scale due to the strong organisation of a number of integration efforts (powdered milk manufacturers/slaughterhouses). These integration efforts steer veal calf farmers in the right direction, aided by contracts (payments per calf), and have achieved the transition from individual to group accommodation for

the calves in a relatively short period of time. The sector is strongly oriented towards exports, particularly exports to France, Germany and Italy. These countries have a stronger preference for pale veal than the Netherlands. It is unclear whether this branch of the industry will be able to maintain its position in the coming years. Due to the changes in the dairy policy (the possibility of a reduced availability of milk powder and whey powder) and particularly in the event of a possible decoupling of the premiums (there is currently still a slaughter premium of € 50 per calf), the situation may become less favourable.
Part of the reason why intensive livestock production was able to grow so large was the construction of a strong structure in the 1960s and 1970s for the supply of feed raw materials (through the ports of Rotterdam) and their processing into a varied range of compound feeds. The impulse from the compound feed companies allowed the previously small-scale (mixed) holdings in the sandy areas to specialise, as well as allowing an extensive new poultry sector (consisting mainly of broilers) to be built up in a relatively short period of time. An entire network of sales and processing (slaughterhouses), supply (breeders, stock farms etc) and service provision (animal health care, transport, research and finance) sprung up around this. The increasing demand from the EU market ensured enormous growth. Due to the environmental problems and changes in the EU policy (the grain policy), an end to that growth appears to be in sight. What remains, however, is a strong foundation for intensive livestock production with related activity.

2.3.3 Sub-complexes

Five sub-complexes can be distinguished within the domestic raw material-based agro-complex. Figure 2.3 shows the development of their total added value. Pasture-based livestock production still appears to be the largest, although its share is decreasing. Greenhouse horticulture increased in importance over recent decades, but experienced stagnation in the last few years. The share of the arable farming complex stood out in 2003 due to its high yield prices, whereas the share of intensive livestock production since 1985 has remained reasonably constant.
Many activities in supply, processing and sales are organised on a cooperative basis, allowing farmers and growers to influence adjoining links within the chain. Below is a brief profile of the sub-complexes.

In 2003, the *arable farming complex* contributed over 20% of the total added value of the domestic raw material-based agro-complex. The cropping plan – with a large share of potatoes and sugar beet – is unique within the EU. Elsewhere, grain usually predominates. A large share (37%) of the area of open field vegetable cultivation takes place on arable farms. In terms of potato processing, the Netherlands occupies a top position within Europe, both for potatoes for consumption and starch potatoes. This success is dependent on the large quantities of high-quality potatoes. The developments

Table 2.5

Food and beverages industry according to industry group and sub-groups, 2002

Industry group	Holdings with 100 or more employees	Employed people (x 1,000)	Net turnover (in million euro)
Slaughterhouses and meat processing industry	60	19.9	5,605
Of which: Slaughterhouses (excluding poultry)	20	6.2	2,592
Poultry slaughterhouses	15	3.8	1,130
Meat processing	30	9.9	1,883
Fish processing industry	10	1.9	349
Dairy industry	15	11.3	5,750
Vegetable and fruit processing industry	25	8.7	2,697
Margarine industry	5	1.1	567
Flour industry	5	3.5	1,516
Animal feed industry	20	5.3	3,028
Bread, patisserie and biscuit factories, etc.	30	5.8	677
Cocoa bean processing industry	15	5.9	2,533
Mineral water and soft drinks industry	5	2.5	1,023
Other food and beverages industry	65	28.6	18,666
Total food and beverages industry	255	94.5	42,411

Source: CBS.

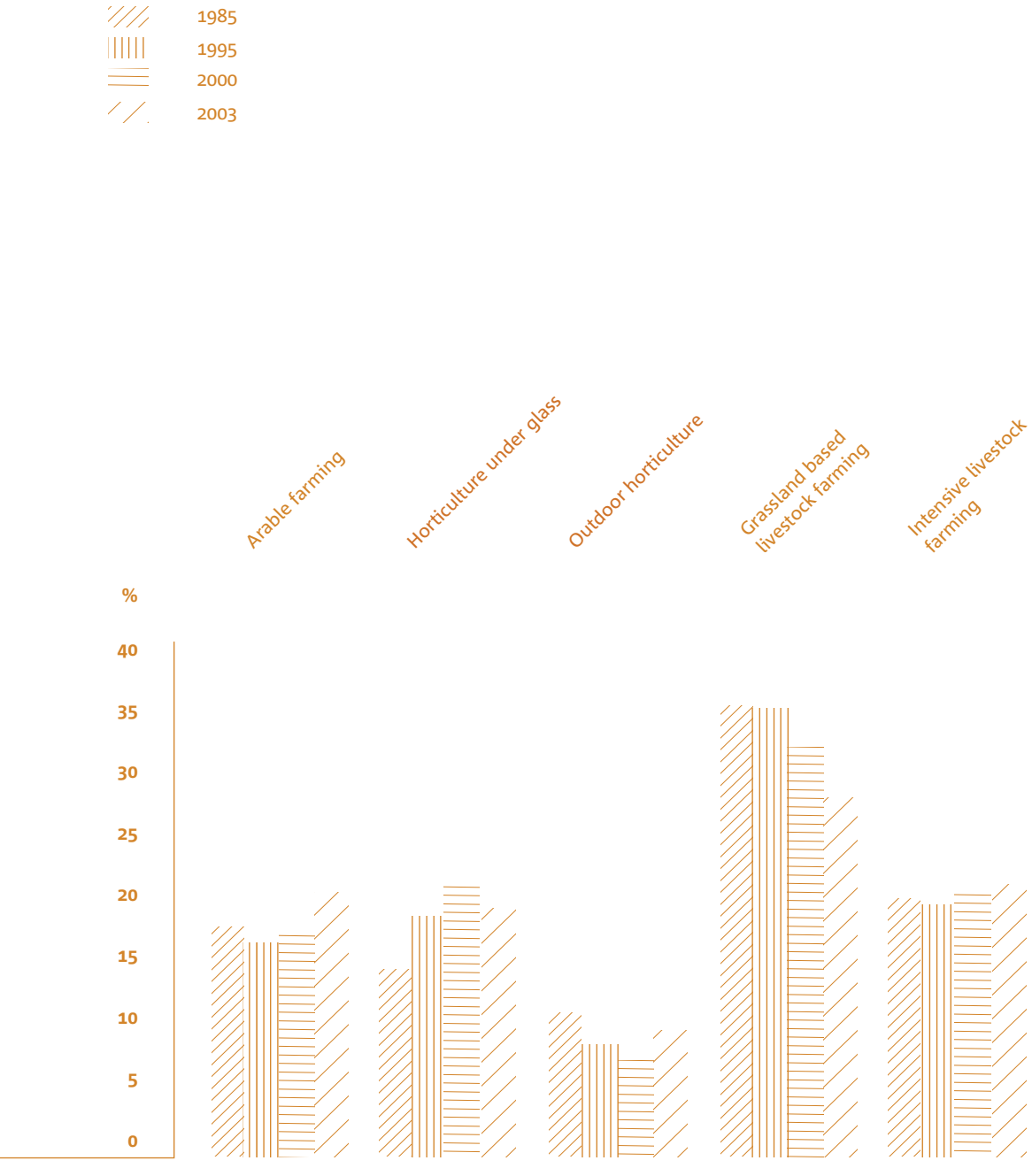
within the market have also been favourable, such as the growth of fast food restaurants and the demand for convenience food.

The *open field horticulture complex* comprises 10% of the domestic agro-complex. This open field horticulture complex relates to open field-grown vegetables, fruit, flower bulbs and tree nurseries. Within this complex, the share of tree nurseries and flower bulbs has increased while the share of vegetables and fruit has declined. In terms of tree nursery products, the Netherlands is the most important export country within the EU, followed by Belgium and Italy. The Netherlands is a type of 'maternity ward' for flower bulbs: many bulbs can only be cultivated in the Dutch climate zone. Despite the fact that the Netherlands is a relatively small-scale producer of fruit, it is a major exporter thanks to initial imports from other countries.

The *greenhouse horticulture complex* accounts for 20% of the domestic agro-complex. Greenhouse-grown vegetables, pot plants and border plants

Figure 2.3

Division (in percent) of the added value of the Dutch agro-complex (domestic raw materials) into sub-complexes, 1985-2003
Source: LEI.



both account for 26% of the production value, the share of cut flowers is approximately 42% and the remaining 5% relates to mushrooms. A shift has taken place within greenhouse horticulture over the last 20 years from vegetables to cut flowers and particularly pot plants. The strong competitive position of the complex can be attributed to the combination of specialised deliveries, trade and logistics, a high technological and organisational level of expertise and a favourable geographical situation.

The *pasture-based livestock farming complex* (30%) is traditionally the largest of the sub-complexes. Dairy farming forms the basis for this sub-complex. The sector enjoys a very positive image. Dairy farming is the largest form of land use in the Netherlands, and thus very important for the image of Dutch primary agriculture and horticulture, as well as the landscape. The Netherlands is a major exporter of dairy products. The dairy industry is very concentrated, both nationally and internationally: two companies – Friesland Foods and Campina – account for 80% of all the milk processing.

In 2003, the *intensive livestock farming complex* had a 23% share in the added value of the domestic agro-complex. Pig farming, formerly part of the mixed farm, is increasingly taking place on specialised farms. There are comparable developments in poultry farming. The total meat complex has become very concentrated in just a few years. In the slaughterhouse sector, the six largest pig slaughterhouses together account for approximately 95% of all slaughters. The Vion Food Group – which was recently formed from a merger of the pig-related activities of Hendrix Meat (Nutreco) and Bestmeat (formerly Dumeco) – has a share in this of approximately 65%. There is a comparable situation within veal calf slaughterhouses, with one dominant party (Van Drie). The concentration is lower in the poultry slaughterhouse sector, though here too the largest share of the capacity is in the hands of a limited number of holdings.

2.3.4 Primary sector

The development of Dutch agriculture and horticulture over recent decades can be characterised with the words: expansion, intensification, increased productivity and farm expansion.
The expansion has emerged from the fact that the production volume has increased more than 4.5-fold between 1950 and 2000 (table 2.6). Since the mid-1980s, the growth rate has slowed considerably; between the 1950s and the 1970s, the production volume rose by 40 to 50% every ten years. In the 1980s, this figure was still approximately 30%, and in the 1990s, it was only about 10%.
In principle, in the case of a shrinking area of cultivation, production expansion is linked with intensification, with extra input from purchased production means per hectare. This phenomenon was very common up until the 1980s. Later, the consumption of purchased production means hardly increased at all, and certainly less than the production volume. This

Table 2.6

Structural developments within the primary sector, 1950-2000

	Unit	1950	1960	1970	1980	1990	2000
Number of holdings	x 1000	315	284	185	145	125	97
Manpower [a]	1000 ALU [b]	550	437	290	235	215	198
Area of cultivated land	x 1000 ha	2,328	2,317	2,143	2,020	2,006	1,956
Volume of capital [a]	Index	97	100	125	173	190	200
Volume of purchased production means	Index	53	100	160	240	260	260
Volume of gross production	Index	71	100	146	225	290	325
Employment level [a]	ALU/farm	1.75	1.54	1.57	1.62	1.72	2.04
Farm area	he/farm	7.4	8.2	11.6	13.9	16	20.2
Production volume per farm	Index	64	100	224	440	660	945
Volume of capital per farm [a]	Index	84	100	190	339	430	520
Production volume per hectare	Index	71	100	158	258	335	383
Volume of purchased production means per hectare	Index	53	100	174	276	301	310

a) estimate
b) Annual Labour Units
Source: LEI, largely based on CBS data.

chiefly relates to energy (particularly fossil fuels), artificial fertiliser, concentrated feed and chemical pesticides, as well as all kinds of service provision. The average production volume per farm has grown about 15-fold in the period since 1950. This process was coupled with larger machines and buildings, which also resulted in a change in the appearance of the farms: they became larger, more 'rationalised' and more uniform.
The production volume per worker increased roughly as strongly as the volume per farm. Farm labourers disappeared as early as the 1950s, and the number of workers per farm declined dramatically. In the 1990s, increases in scale in greenhouse horticulture in particular were once again linked with a fast increase in the number of workers per farm. The area of land per farm increased from an average of 7 hectares in 1950 to 20 hectares in 2000. The amount of capital per farm (excluding the value of the land) increased even more strongly. It is estimated that this will have grown about 6-fold in 50 years' time (table 2.6). Here, too, there was a clear substitution of labour and to a lesser extent land, replaced by capital and purchased production means.

A shift in the production range

Roughly speaking, non-pasture-based production has increased the most. Since the early 1960s, egg production has increased by a factor of two, pork production by a factor of four, horticultural production by a factor of seven and poultry production by a factor of nine. In the same period, arable production only increased by 60 to 70%, and the production of beef by around 50%. Milk production grew by 90% between 1960 and the arrival of quotas in 1984. Since then, however, it has declined by over 10%.
The nature of arable farming makes it the most pasture-based sub-complex, and it therefore has the fewest opportunities to increase production through the substitution of land. However, it is true to say that the productivity of the land has been increased significantly: around 1950, one hectare would produce approximately four tonnes of wheat, whereas today a hectare yields around 8.5 tonnes. Back then, 25 tonnes of potatoes per hectare was considered a reasonable yield, whereas almost double that is achieved these days.
The scale of production in the livestock production sectors has been declining over recent years, partly due to the influence of milk quotas as well as the manure policy in particular. The Dutch pig population reached its maximum level in 1997 with a total of 15.2 million animals. That figure has now fallen to around 11.5 million. The poultry population comprised almost 105 million birds in 1999, and there were still 101 million in 2002. The outbreak of fowl plague in 2003 resulted in a major reduction of the poultry population.

Advantage for consumers

The increase in the production value continued to lag a long way behind that of the production volume. In nominal terms, the gross production value of agriculture and horticulture is now more than 13 times what it was in the early 1950s. However, when this is corrected for inflation, the actual

Table 2.7

Gross production (in million euro) of Dutch agriculture and horticulture, 1995-2004

	1995	2000	2002	2003	2004
Total production (basic prices)	19,732	19,889	19,979	20,053	19,549
Arable and horticultural products	9,037	9,658	10,266	10,676	9,912
Cereals	239	234	254	287	248
Potatoes	828	645	877	928	801
Sugar beet	331	303	286	276	262
Other industrial crops	3	27	30	44	37
Fodder crops	641	522	620	580	544
Vegetables (fresh)	1 886	1,952	2,023	2,099	1,710
Fruit (fresh)	312	322	359	453	459
Flowers and plants	4,010	4,836	5,122	5,213	5,048
Other crops	757	818	695	796	803
Livestock products	9,346	8,584	7,924	7,457	7,672
Beef cattle	1,638	1,250	1,164	1,270	1,324
Pigs	2,806	2,444	1,904	1,669	1,933
Horses	15	36	32	30	31
Sheep and goats	101	120	224	201	186
Poultry	644	685	634	380	426
Other animals	11	14	12	14	14
Milk	3,710	3,548	3,487	3,470	3,383
Eggs	360	402	357	343	295
Other animal products	61	85	110	80	81
Agricultural services	1,273	1,559	1,696	1,826	1,870
Other goods and services	76	88	93	94	95

Source: CBS.

production value has only increased by around 60%. One should also bear in mind that this was for a volume that is 4.5 times as large as in the fifties. This means that a severe price reduction took place for agricultural products. In other words, the largest share of the productivity gain has been passed on to the consumer.
Table 2.7 shows the recent development of the gross production value of agriculture. Ornamental plant cultivation has been showing signs of steady growth over recent decades. However, the value of milk production is showing signs of a reduction. The largest fluctuations can be seen in intensive livestock production. The production value in the vegetable sector – about three-quarters of which comes from greenhouse vegetables – showed a slight positive trend. In 2004, the large supply of crops like tomatoes and cucumbers on the European markets was a factor in the low prices and therefore also for a lower production value.
For the agricultural sector as a whole, the total gross production value of approximately € 17 billion in the mid 1980s rose to around € 20 billion in the first few years of the 21st century. This increase of over 0.5 % per year remains quite a long way behind inflation; in real terms, this therefore means a reduction.

2.4 Agricultural and horticultural holdings

2.4.1 Types and sizes of holdings

The Netherlands currently still has 80,000 agricultural farms and horticultural holdings (table 2.8). The decline has been faster over the last few years than during the 1990s, partly due to the major reorganisation of intensive livestock production, influenced by the manure policy.
Although farm expansion is a strong trend, we are not talking about 'mega farms' like the type found in the US and in Eastern Europe. On the other hand, the Netherlands has relatively few 'subsidiaries.' Compared with other EU countries, the farms in the Netherlands are relatively large in an economic sense (DSUs) but small in terms of the area they cover. Around 30% of the farms have less than five hectares of land. One explanation for this relatively high percentage is the large number of farms with horticulture (greenhouse or otherwise) and intensive livestock production. Around 12% of the farms have more than 50 hectares. There is considerable variation around the average farm size of 85 DSUs (figure 2.4).
It goes without saying that the growing group of larger farms accounts for an increasingly large proportion of production. The farms with a size of 100 DSUs or more – 30% of the total number – currently represent almost 70% of the production capacity (figure 2.5).
In most sectors, employment in agriculture and horticulture mainly relates to family labour. The relatively high costs of paid labour are a limitation for farm expansion. Nevertheless, the use of non-family workers has increased over recent decades, particularly in greenhouse horticulture. The share of employees in the total labour has risen from approximately 15% in 1980 to around 30%.

Table 2.8

Development of the number of holdings
by type, 1980-2004

		1980	1990	2000	2004
Total agricultural and horticultural holdings		144,990	124,900	97,480	83,890
of which:	Arable farms	16,730	16,260	13,750	12,630
	Open field vegetable holdings	2,860	2,500	1,460	1,120
	Bulb growing business	2,400	1,750	1,340	1,120
	Fruit holdings	3,410	2,810	2,210	1,840
	Tree nurseries	2,560	2,930	2,810	2,590
	Greenhouse horticultural holdings	11,000	10,240	7,910	6,390
	Dairy farms	60,040	39,550	26,820	22,280
	Pig farms	9,330	9,200	6,060	4,180
	Poultry farms	2,450	2,140	1,830	1,350
	Veal farms	1,500	1,250	1,280	1,160
	Other holdings	32,710	36,270	32,010	29,230

Source: CBS agricultural census.

The increase in employment in agriculture is also partly determined by the rate at which farms are closing down. In only around a third of cases do the older entrepreneurs have a successor lined up (approximately 60% of all farmers are older than 50) (Berkhout & van Bruchem, 2005).
Besides measures within the framework of the manure policy (*Regeling Beëindiging Veehouderij*, Scheme for the termination of livestock production), the recent decline in the number of farms is also due to the severe outbreaks of animal diseases and the aftermath of those outbreaks: swine fever (1997), foot and mouth disease (2001) and fowl plague (2003). The generally straggling incomes in agriculture and horticulture have also contributed to the closure of a relatively large number of holdings in recent years.
The average agricultural or horticultural holding does not break even, at least not if the normal payment for labour (collective labour agreement wages) and the capital (interest) are taken as criteria. One important aspect is that entrepreneurs not only work with their own labour but also with a relatively large amount of their own capital. This applies particularly in the pasture-based sectors. This high solvency makes the sector less vulnerable than one might expect on the grounds of productivity.

Spread of results

As a rule, larger holdings have a lower cost price, but this requires investments with no advance benefits and which are sometimes difficult to finance. On the other hand, holdings of such a size exhibit major differences in cost prices and results. Figure 2.6 provides insight into the effects of scale and management. In this figure, holdings participating in the LEI Farm Accountancy Data Network are divided into three groups on the basis of their size in DSUs: small, medium and large. The variation in the family income (in euros per year) is given for each group, that income per farm being an average over the years 2001-2003. The distribution is indicated by a vertical line, with further indications for the average of the whole group, and for the best, modal and worst faring section of the group (one third in each case). The larger the holding, the higher the average income. This is a consequence of a lower cost price per unit, and thus also a higher margin, and due to the fact that many units are sold (with that margin). Within the groups of holdings, there is a broad distribution in family incomes from the farm. The larger the holding, the greater the distribution. The effect of a slightly more favourable cost price is a large share of the income within larger holdings. On the other hand, the negative impact of disappointing production is also large. The distribution cannot simply be attributed to differences in management, with the blame thus being passed on to the entrepreneurs. External factors and the type of soil can also play a role, and the entrepreneur can do very little in the short term to influence such factors. In addition, there may also be holdings with a low income because they have taken out large loans to finance an increase in scale. Revenues from this may occur years later. In national terms, in view of the large distribution in incomes, there would appear to be at least as much benefit to be gained from improvements in the results for the given holding size as through increases in scale alone, also because the latter goes hand in hand with a financial battle over production rights and land, in which income yet to be earned in agriculture is paid out to those taking retirement.

2.4.2 Organic agriculture and horticulture

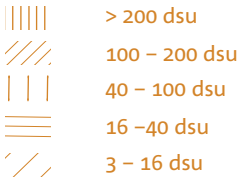
In 2004, there were just under 1,400 organic holdings, 50 fewer than in 2003; the organic holdings that closed down were mainly pig farms. Altogether, the organic farms cultivated an area measuring over 48,000 hectares, which is approximately 2.5% of the area of agricultural cultivated land (table 2.9). The certified areas of arable farming, fodder crops and grassland increased by more than 20% in 2004, while the area used for horticulture decreased. With a share of 2.5% of the area, Dutch organic farming is lagging behind the EU average, which was 3.5% at the end of 2003.

2.4.3 Diversification

The income formation of farming households – along with the structure of the holdings – is gradually diversifying. This can mean broadening (introducing non-agricultural activities within the holding), deepening (aiming for a larger

Figure 2.4

Number of farms per DSU class, 1980-2004
Source: Statistics Netherlands (CBS)



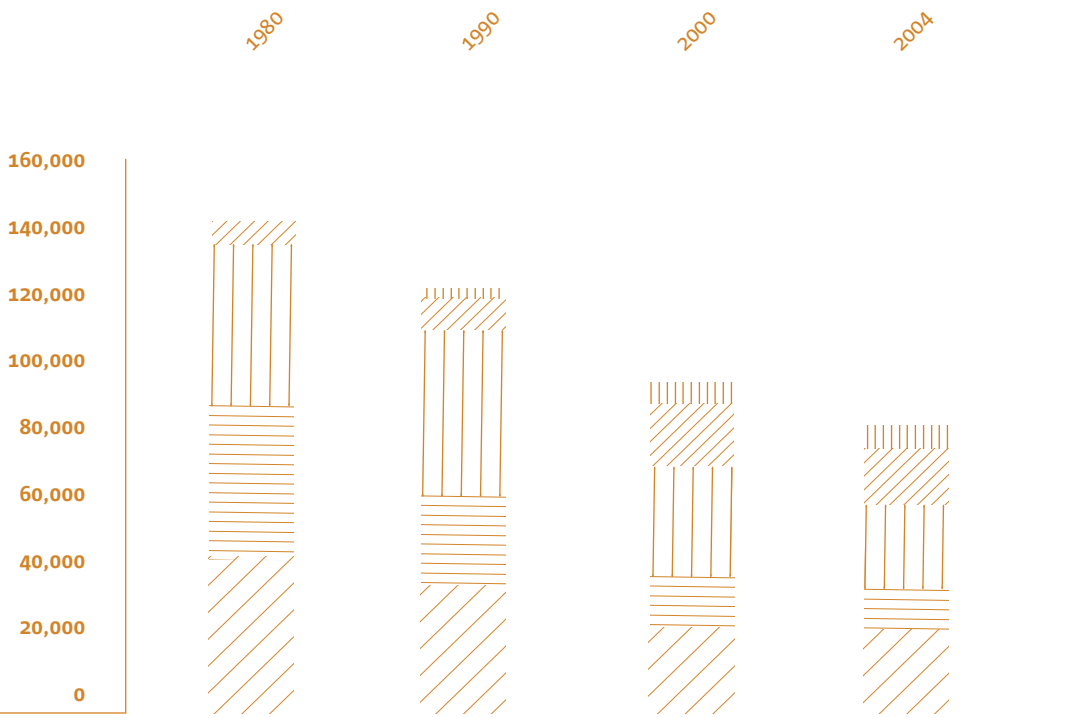


Table 2.9

Organic agriculture and horticulture, 1999-2004

	1999	2000	2001	2002	2003	2004
Number of certified holdings	936	1,121	1,202	1,233	1,434	1,383
Certified area (x 1,000 hectares)	27.0	33.0	38.0	42.6	41.9	48.2
Proportion of area of cultivated land (%)	1.1	1.3	2	2.2	2.2	2.5

Source: Biologica (2005).

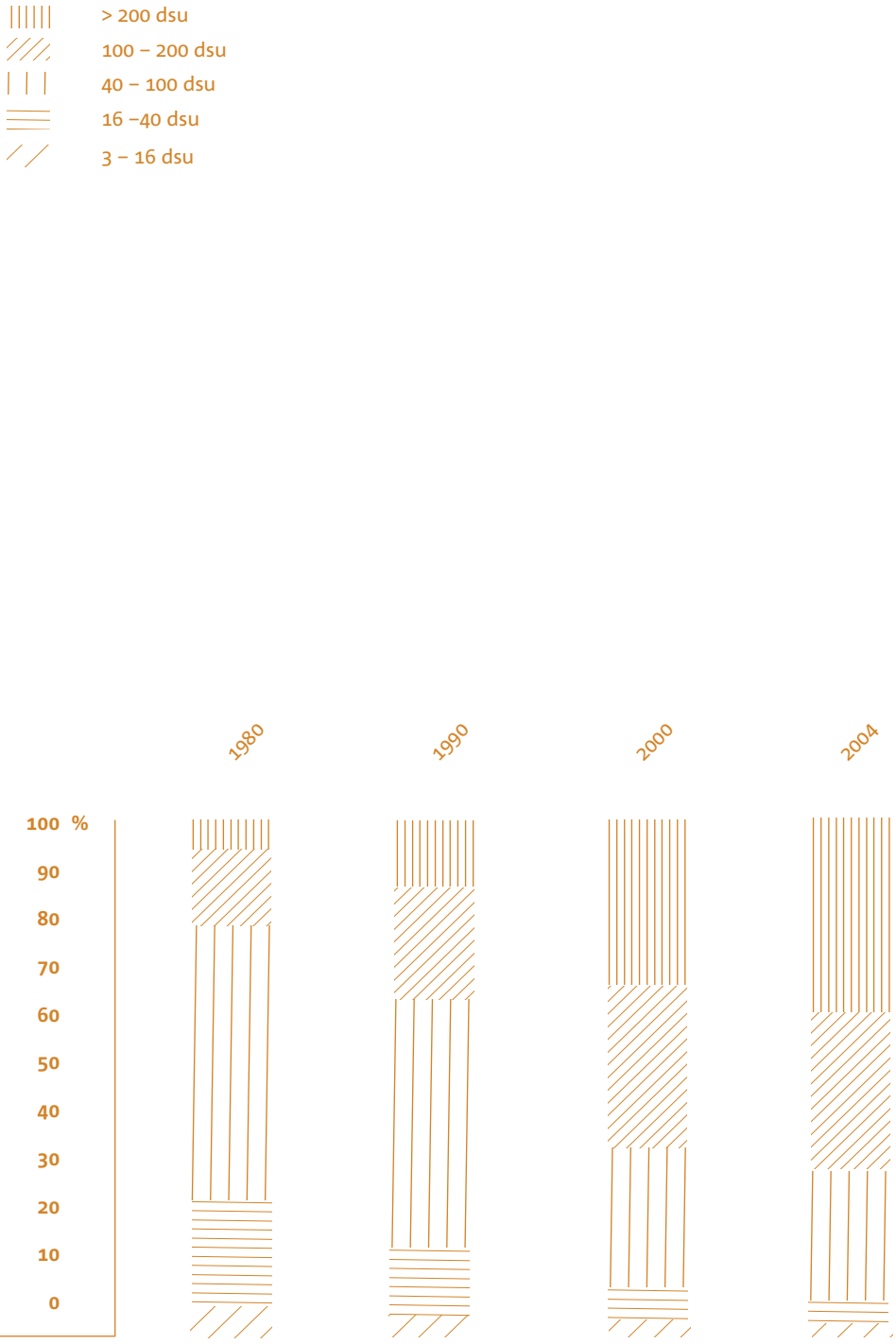
share of the added value within the chain, for example through processing), doing paid work outside the holding or making capital, land or quotas available to others.
Broadening refers to non-agricultural activities within the holding, such as:

- so-called 'green' and 'blue' services (landscape management, nature management, meadow bird management, goose rescues, water quality care, water storage, laying footpaths and cycle paths, contract work for conservation organisations, etc.)
- agro-tourism and recreation (farm campsites, 'polder sports', accommodation, apartment letting, cafés, etc.)
- wind energy and biogas (which are then supplied to third parties)
- 'care farms' (therapeutic farm-based activities for people needing social care), farm-based crèches, etc.
- hiring out of buildings for non-agricultural purposes.

This summary largely coincides with the criteria as applied in the agricultural census. Some people think that 'broadening' also includes activities linked to the holding such as making their own cheese, producing their own fruit juice, running a farm shop or selling produce from their home. Since these activities are directly linked to the primary function of the holding, other people prefer to speak in terms of 'deepening' or 'extending' rather than broadening.
'Green' and 'blue' services have a strong collective character and are largely collectively financed. The remainder are private services, though are also sometimes partially funded by collective means, for example in cases of care farms and fiscal facilities for wind turbines. One important difference is that the emphasis of collective services lies on the 'land factor:' they are pasture-based. Private deepening generally requires more investment and labour.

Figure 2.5

Share of the production capacity (DSU) of the farms
by DSU class, 1980-2004
Source: Statistics Netherlands (CBS), computation LEI.



According to the 2003 CBS agricultural census, over 31,000 agricultural and horticultural holdings were occupied with one or more broadening or deepening activity (table 2.10). This accounts for 37% of the total number, varying from 19% in greenhouse horticulture to 46% in dairy farming. Understandably, broadening and deepening are seen more often on pasture-based holding types. Many broadening activities are linked with the land anyway, and greenhouse complexes or intensive livestock production farms do not appear to be the most inviting environment for recreation and the like.
Younger entrepreneurs tend to broaden their activities more than older entrepreneurs: 42% of those aged under 40 did so, compared with 30-35% of those aged over 50 and 21% of those older than 65. Three-quarters of the broadening holdings limit themselves to just one broadening activity. The average number is 1.3.
The most common activity (with 21,500 counts) is nature management (table 2.11). This also includes nest protection of meadow birds, in which an estimated 15,000 holdings participate, but which does not make a substantial contribution to the income. Agricultural nature management is relatively common both on larger holdings (particularly dairy farms) and on fairly small extensive farms. Some of these were holdings that leased out their milk quota.
In countries like the United Kingdom, Austria, France and Germany, the subsidy programmes for agricultural nature management have a broad set-up and a low threshold for participation. The Netherlands generally invests in specific measures, aimed at particular types of vegetation or animals. This makes participation more difficult.

Contract work is also an important diversification activity. It is seen relatively frequently on arable farms in particular. This is linked with a surplus capacity of machines, and possibly also of labour, for example if there is a successor lined up. Collaboration may also play a role, in the sense that one arable farmer has one type of machinery and another arable farmer has another type.
Sales from home are fairly common for arable farms and horticultural holdings. Such sales chiefly concern potatoes, vegetables, fruit, flowers and trees.
In 2003, approximately 2,500 holdings were occupied with agro-tourism and other forms of recreation. An inventory from 1998 counted 2,250 such holdings. There therefore seems to have been little growth in recent years. The CBS even notes a decline compared to 1999, but changes in definition may play a role in this. The impression from practice is that ‘farm camping’ is not showing much sign of growth, but that this is in fact still the case for various forms of day trips, such as ‘polder sports.’
Agricultural work and care go hand in hand on care farms. The number of care farms rose from 75 in 1998 to 372 in 2003, with an average of six people receiving care per holding. The province of Gelderland has by far

Figure 2.6

Differences in family farm income by size category, average from 2001-2003
Source: LEI.

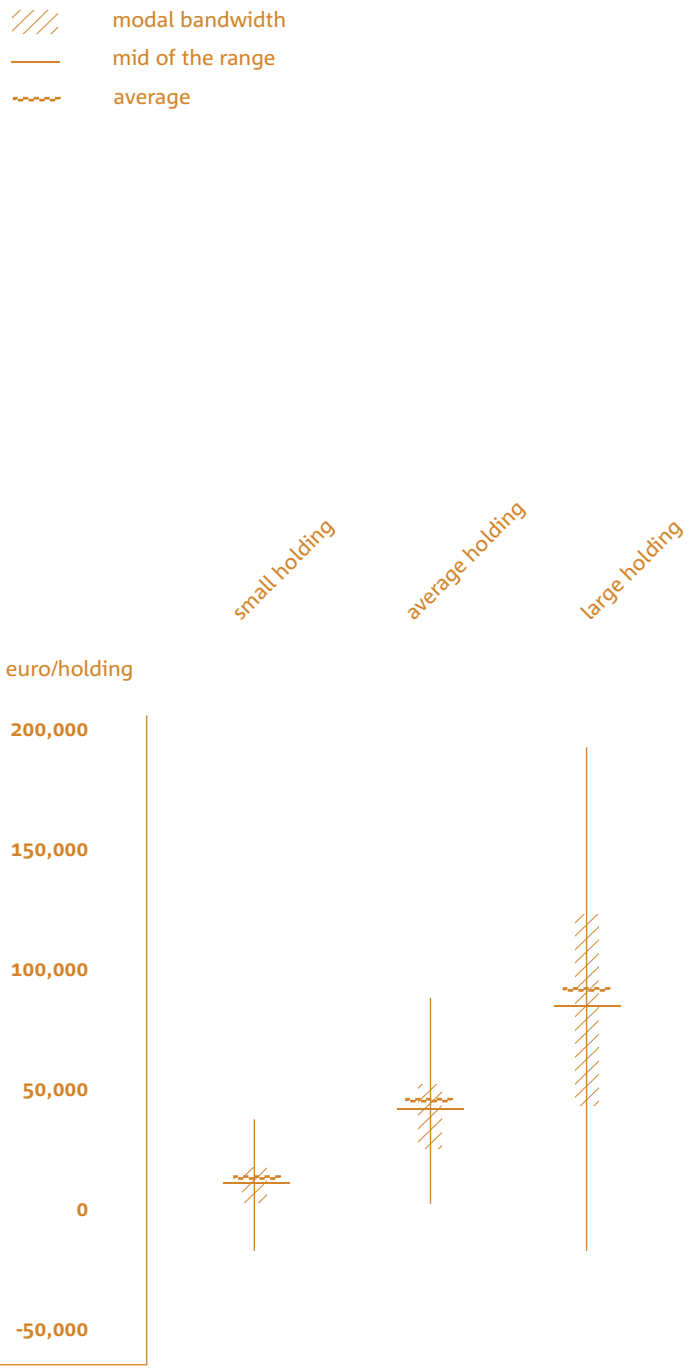


Table 2.10

Holdings with and without diversification activities*) by type, 2003

Type	Total	Without broadening	With broadening	%[b]
Arable farming	12,610	7,390	5,220	41
Dairy farming	22,860	12,410	10,450	46
Other grazing animal farms	20,140	13,900	6,240	31
Intensive livestock farms	5,920	4,580	1,340	23
Combined	7,980	4,630	3,350	42
Greenhouse horticulture/mushrooms	7,160	5,760	1,400	19
Open field horticulture	8,830	5,550	3,280	37
All types	85,500	54,220	31,280	37

a) including processing and sales from home; this is estimated to concern around 6,000 holdings, after correction for double counts.
b) as a percentage of the total number of holdings.
Source: CBS agricultural census, processed by LEI.

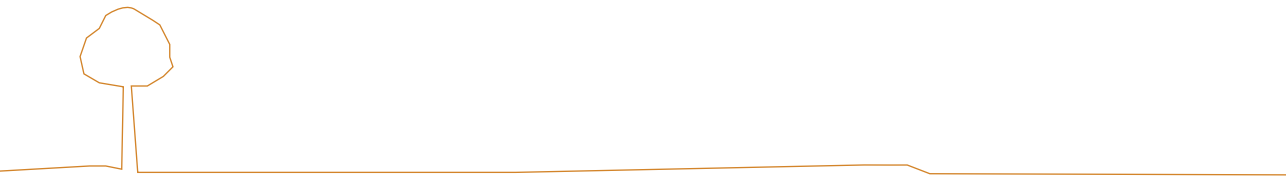


Table 2.11

Diversification activities of agricultural holdings, 2003

Activity	number	%[a)]
Recreation	2,540	8
Care	370	1
Storage of goods	3,830	12
Nature management	21,550	69
Energy production (mainly wind turbines)	490	2
Contract work	4,980	16
Processing of products	1,100	4
Sales of products from home	5,380	17

a) holdings within which the activity concerned takes place
as a percentage of the number of holdings with diversification activities.
Source: CBS agricultural census, processed by LEI.

the most care farms. These care farms generally centre around the provision of a day of activities for people with a need for help or care. Sometimes there is a combination of different forms of care provision, such as residential/work locations in combination with daily activities. The supervision of these activities is financed in various different ways, with wide ranging prices. Many care farms also have a farm shop.
Due both to the growth in the number of wind turbines and the increase in the capacity per turbine, the total deployed capacity of wind energy has increased strongly in recent years, from about 300 Megawatts in 1997 to 900 Megawatts in 2003. An estimated 50-60% of the wind turbines are in the hands of farmers.

Economic significance
The total turnover of broadening and deepening activities lies in the region of € 500 million, with a total contribution to incomes of € 150-200 million. The broadening activities are estimated to bring in around € 290 million, approximately 1.5% of the total turnover. Of this, more than half can be attributed to contract work, the lion's share of which is carried out by arable farmers (particularly for other arable farmers). The earnings could be around 35% of the turnover, meaning that over € 100 million in incomes could be achieved through these activities: around 3.5% of the corporate income of the sector. The contribution to the income of each holding with broadening activities could amount to about € 4,000, approximately 10% of the average corporate income.
For specialised dairy farms, the turnover from broadening activities (processing and sales from home) is estimated at around € 75 million. The production of farm cheese (approx. € 30 million) forms a major part of this. In view of the fact that processing and sales from home also occur within other types of holding, the abovementioned € 75 million can be multiplied by a factor of two to three to reach a national total. The total amount could then be around € 200 million and the contribution to incomes could be between € 50 million and € 100 million. The extra contribution to incomes – i.e. in comparison with unprocessed supplies 'to the factory' – is probably less.

Motives and problem areas

Quite a lot of research has been done into the question of why farmers are or are not active in the field of broadening (Vogelzang et al., 2004; Van den Ham et al., 2001). Reasons why farmers *do* choose to offer diversification activities include:

- a gap in the market, and it brings in income;
- social interest and appreciation of the green environment and green services;
- it goes well with the objective of extensification;
- a lack of prospects for competition on the world market;
- a challenge for operational management, creativity and entrepreneurship.

Reasons *not* to offer diversification activities:

- the entrepreneur's motivation comes from the technical aspects of the profession;
- the type of work involved in broadening does not appeal to the entrepreneur;
- high costs, for example of the milk quota, make intensive production necessary and leave little scope for broadening;
- broadening is hindered by regulations and zoning plans;
- compensation is considered to be temporary: it is risky to focus one's strategy on this;
- the desired broadening does not fit in with the location of the holding;
- broadening does not fit in with the policy regarding food safety (reasons of hygiene etc.);
- the necessary labour is not available;
- the extra physical or psychosocial burden (this applies particularly to older entrepreneurs).

2.4.4 Part-time holdings

Of the 84,000 agricultural and horticultural holdings that were counted in 2004, approximately 62,000 were operated as the entrepreneurs' main profession (table 2.12). Approximately 6,500 of these had sideline activities; the rest can be seen as full-time farmers. On approximately 10,000 holdings, the person concerned therefore had another main profession. In addition, there were almost 12,000 so-called 'semi-retired farmers': older people who work within the holding for a limited amount of time. The number of sideline holdings has declined roughly as sharply as the total number of holdings since 2000.

The significance of the sideline holdings varies greatly per holding type. Of the specialised dairy farms, only 2% were operated part-time in 2004. This is hardly surprising in view of these holdings' large and permanent need for labour. Sideline holdings are also uncommon in greenhouse horticulture.

The most common type of sideline holding is the so-called 'other grazing animal farm,' accounting for roughly a quarter of the total number in 2004. These are farms with sheep, young cattle, nursing cows etc, including holdings that had leased their milk quota.
A relative decline in sideline holdings has occurred in all holding types, the least on 'other grazing animals farms' and on arable farms. The need for labour on arable farms is often such that there is scope for sideline activities in certain seasons, whereas the development of the income has pushed up the need for extra income.
The increased burden of regulations may have played a role in the decline in the number of sideline holdings. In addition, the greater emphasis on broadening activities may have led to more farmers developing new sources of income within their holdings, resulting in the holding continuing to be registered as a main activity.

2.4.5 Income outside the farm

The significance of the income earned by farmers and their partners outside the holding has increased in recent years. In 2002, the average external income per holding was almost € 8,000, almost 18% of the total income. The most important components were income from labour (€ 5,000) and social security benefits (€ 3,800). The incomes from capital, which are also included in sideline incomes, were on average minus € 1,100 in 2002 due to disappointing investment results.
Attendance fees, income from sideline activities of the farmer and his/her partner and calculated pay from own labour during construction work are included under the item 'income from labour outside the holding.' Figure 2.7 indicates the course of such income for all agricultural and horticultural holdings. There was a clear increase after 1990. Incomes from work outside the holding are now almost three times what they were in 1990. After corrections for the increase in the gross wages that has occurred in the meantime, the volume of work outside one's own holding has increased by around 80% since 1990. The most important causes appear to be the fact that the average farm income has declined considerably over recent years, and the phenomenon that partners of the heads of the holding continue to pursue their own profession more than in the past.
On average, almost € 5,000 in incomes was earned through work outside the holding in the years 2001-2003, around 10% of the total income. These incomes have a negative correlation with the size of the holding: there is less time for sideline activities on large holdings, and the need for additional income is also less.
The additional incomes are generally lower in horticulture, with the exception of fruit-growing holdings. On greenhouse horticultural holdings, these additional incomes have amounted to € 2,500 to € 3,000 over recent years: less than 4% of the total income. On pig farms, that amount was over € 6,000. In the years 2001-2003, this equated to more than 80% of the total income, as the farm incomes were very low. On average, € 5,700 in additional

Table 2.12

Agricultural and horticultural holdings according to main and sideline professions, 2004

	All enterprises	Main profession holdings			Part-time farms		Semi-retired farmers
		Number	With off farm activities	Ditto, in %	Number	In % of all holdings	
Arable farms	12,634	8,797	1,091	12.4	2,103	16.6	1,734
Other horticultural holdings	8,572	7,092	702	9.9	803	9.4	677
Greenhouse horticulture and mushroom farms	6,745	6,198	226	3.7	189	2.8	358
Dairy farms	22,280	20,466	1,431	7.0	467	2.1	1,347
Other grazing animal farms	18,817	7,727	1,436	18.6	4,760	25.3	6,330
Intensive livestock farms	7,063	5,894	872	14.8	816	11.6	349
Combined farms	7,783	5,683	773	15.7	1,041	13.4	1,059
Total	83,890	61,857	6,531	10.5	10,179	12.1	11,854

Source: CBS agricultural census, processed by LEI.

income was earned on arable farms (13% of the income) and approximately € 4,500 on dairy farms (9% of the income). Factors like holding size, labour requirements (and the fluctuations in labour requirements during the course of the year) and the level of the farm income play a role in these differences.

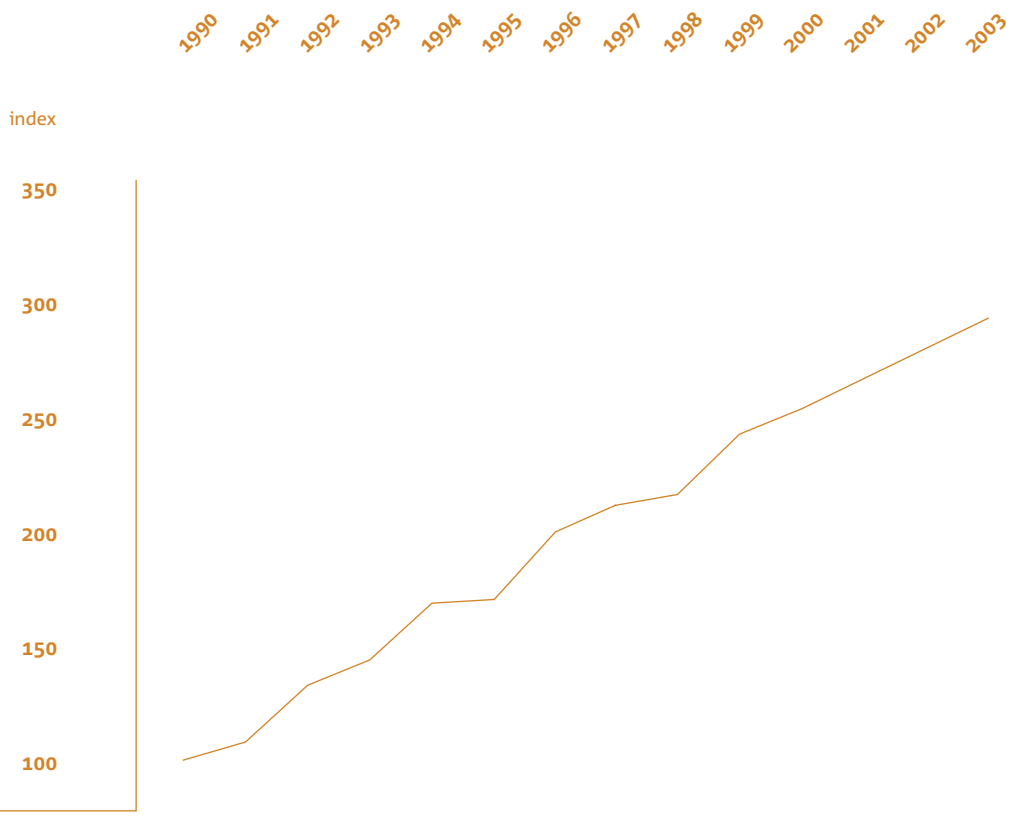
2.5 Conclusion

Despite the relatively small area available, the Netherlands has developed into an agricultural trading nation of some stature. This status is due to the combination of very favourable production conditions, a favourable location, a limited domestic market, intensive production methods, a well-educated work force, market-oriented institutions, an open economy and the support from the European market policy and pricing policy. The concentration of the agricultural industry has resulted in a competitive sales structure in many sectors.

In view of the density of the population, Dutch agriculture should in principle be able to broaden itself relatively easily by offering agro-tourism, landscape, farm products, etc. The fact that this is not seen very often is partly due to the strong specialisation of holdings, which is connected with the high costs of land and labour in particular. The earnings from broadening over the whole sector currently make up around 1.5% of the income. This does not alter the fact that it can form a significant source of income for individual pasture-based holdings.

Figure 2.7

Income (index, 1990=100) from work outside the farm, 1990-2003
Source: LEI.



SUSTAINABLE PERSPECTIVE REQUIRES AN EYE FOR THE MARKET, ENVIRONMENT AND SOCIETY

Chapter 3

Driving forces

3.1 Introduction

This chapter covers the driving forces, the factors determining developments in agriculture and horticulture as well as related sections of the industry (the agro-complex). The following matters are examined: the demand for agricultural products (3.2); the international trade and agricultural policies (3.3); the environmental policy relevant for agriculture (3.4); the developments in the use of the area (3.5) and the technological developments and possibilities (3.6).

3.2 The demand for agricultural products

3.2.1 Introduction

The share of the food and beverages industry in consumer spending has been continuously declining over recent decades, from approximately 40% around the year 1950 to less than 15% today. This is partially because the prices of agricultural product have fallen, both in relative terms and in real terms. Moreover, the rise in people's prosperity allows them to spend more on other things, such as cars and holidays. With regards to agricultural products, the consumption of flowers and plants has grown particularly strongly.

A great many changes have occurred within the food package, too. After an increase in consumption in the 1950s and 1960s (due to increased prosperity), health considerations started to play a more important role (the prevention of 'diseases of civilisation'). People started to eat less fatty food, and the consumption of starchy foodstuffs (potatoes and bread) also declined. Recently, there have only been signs of growth in the consumption of just a few foodstuffs (poultry meat, soft drinks). There even appears to be saturation for products like fruit and vegetables.
In order to make predictions for the coming years, we need to look at factors determining demand, like income, population size, population composition and the corresponding lifestyles.

3.2.2 Economic growth and population size

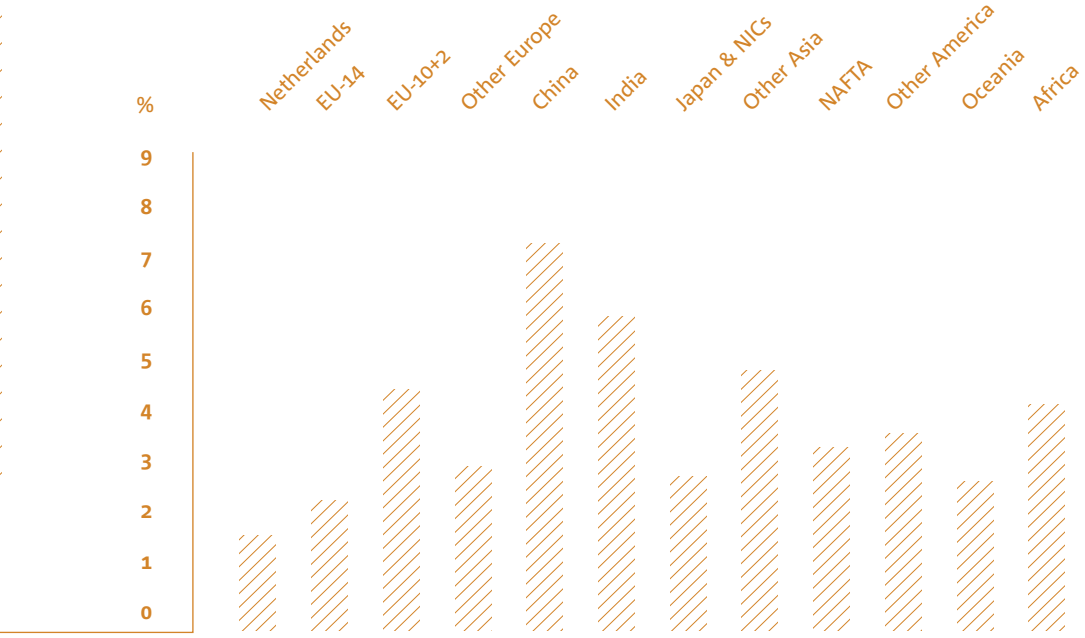
The demand for agricultural products is to a great extent determined by the development of the economy and the population. The size of the population is a particular determining factor for the volume, and the income level is a particular determining factor for the composition of the package. In recent years, the average income in Europe has increased at a rate of over 2% per year. Strong and stable growth in virtually all regions of the world was hypothesised for the period 2004-2014. Growth of around 2.6%

per year is expected in the rich countries (the OECD area), with the Netherlands, the other 14 EU countries and Japan all lagging a little behind the NAFTA countries.[1]
Considerably greater growth is expected for most transitional and developing countries than for the OECD area, particularly for China, India and many other Asian countries, as well as for the new EU member states in Central and Eastern Europe and for Africa (figure 3.1). Brazil, the largest economy in Latin America, will realise an average growth of 4% per year. Growth in Russia – one of the 'Other Europe' countries in the diagram – is expected to slow to an average of 2% as of 2007.
The world's population growth rate is declining, from 1.3% per year over the last ten years to about 1% over the coming ten years. The growth in developing countries (namely Africa, 'other' Asia and India) is slowing, but is still higher than the growth rate in the OECD countries (figure 3.2). At present, 75% of the world's population lives in developing countries, and this proportion will increase in the coming years.
The growth in income per capita in developing countries is generally increasing. Where the demand for food is concerned, the effect of that growth in income worldwide is becoming more important than that of the population growth. Nevertheless, for the richer countries, the income elasticity of the demand for agricultural products is generally speaking minimal: even if incomes rise further, no extra demand arises for a primary need like food.

China: the market of the future?
With a population of 1.3 billion, the People's Republic of China, had an average economic growth rate of 8% per year between 1990 and 2003. The OECD is assuming a continued high growth rate of 7 to 8% per year until 2014. Amongst other things, this will result in a strongly increasing demand for grain, particularly feed grain and oil seed. The expectation is that the stocks built up in China during the 1990s will have been depleted by 2005. On these grounds, the OECD has based its calculations on rising world market prices in nominal terms. China could also become a net importer of poultry meat if production growth lags behind consumption. In the field of dairy products, both production and consumption are still very low in China, although rapid growth is predicted. The non-agricultural sectors will profit the most from a successful conclusion of the Doha round, such as labour-intensive branches of industry. Consequently, the demand for agricultural products will increase even further. Moreover, the increased demand for labour in industry and in the service sector will bring about structural changes in agriculture. A favourable development in exports of industrial products could lead to strong growth in imports of agricultural products, yet China is not expected to allow a significant reduction in self-sufficiency. Technological developments will probably equip the country to continue to feed its own population itself to a great extent using its relatively limited area of fertile land.

Figure 3.1

Economic growth in % per year, 2004-2015
Source: OECD.
Note: EU-10+2: the ten countries that acceded in 2004 plus Romania and Bulgaria



A rise in purchasing power will direct demand more towards meat, dairy and horticultural products and away from rice. Opportunities are presenting themselves to the Dutch agricultural sector with respect to exports and investments in the fields of horticulture, intensive livestock production and, to a lesser extent, dairy (Van Tongeren & Huang, 2004).

Figures 3.1 and 3.2 show that stagnation in the population growth and moderate economic growth are expected for Europe. Until recently, there was still a natural increase in the population of Europe (an excess of births over deaths) combined with added population growth through immigration. The natural growth rate is low in most EU-15 countries, even negative in some countries. It is only through immigration that the population continues to grow, but this remains limited to less than 2% over the next 20 years (table 3.1). A decline is even expected as of 2020.
In the new member states of the European Union – totalling 75 million people in 2005 – a population decline is already happening. Low – and in some cases already negative – birth excesses are combined with net emigration in countries like Poland, Latvia and Lithuania. According to the UN, this will lead to a decline in the size of the population in the EU-25 as of 2015. The OECD is already assuming a slight decline (-0.07% per year) in the population size of Europe over the next few years (until 2014). Only the population of Turkey (not acceding to the EU until 2015 at the earliest) is expected to continue to grow strongly.
All in all, for the time being, the population in the EU-25 is stable and for that reason no major changes in demand can be expected.

3.2.3 Demographic developments in the EU

In addition to income development and population size, the composition and lifestyles of the population are also important for the development of demand for agricultural and food products.

Immigration

Immigration will be the main source of population growth in the European Union over the next decade. All the EU-15 countries have become countries of net immigration, with the exception of the Netherlands: for the first time in many decades, more people left the Netherlands in 2004 than arrived. The CBS (Statistics Netherlands) expects emigration to remain at a relatively high level over the coming years (over 100,000 people per year). Immigration will remain under that level for the time being. The two will not balance each other out until 2010. Furthermore, the number of births will fall sharply in the short term. However, as the average life expectancy continues to rise, the size of the population in the Netherlands will continue to increase gradually up to 17 million people in 2035. The continuing influx of immigrants will further change the demographic structure of Europe, adding

Figure 3.2

Population growth (in % per year) in the world, 2004-2015
Source: OECD.

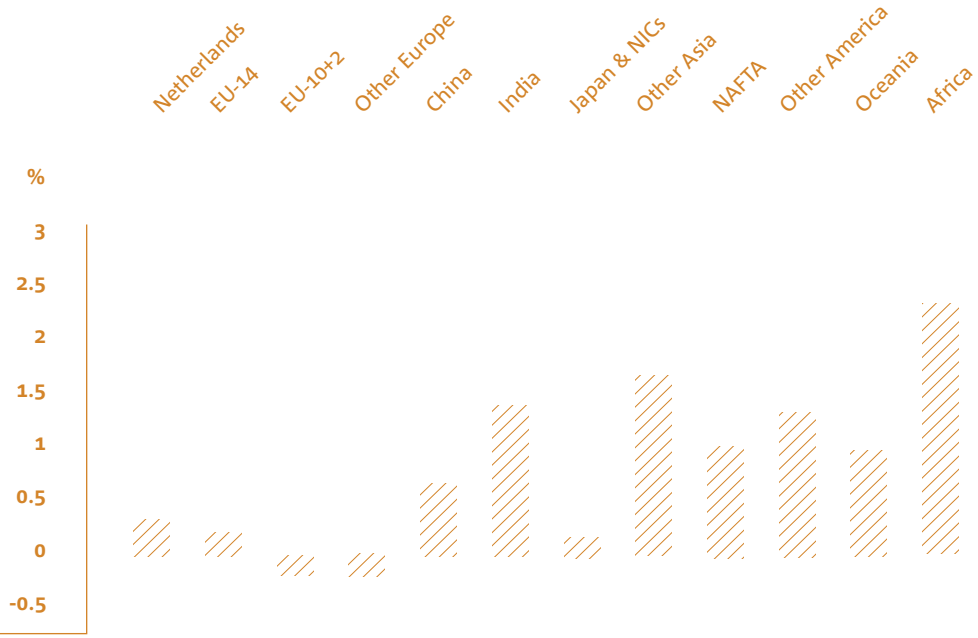


Table 3.1

Population (in millions) of the EU-15, the EU-25 and the EU-28 and a number of individual EU countries, 1975-2025

	1975	2005	2025
EU-15	349	377	384
EU-25	418	452	454
EU-28 [1)]	489	551	575
Germany	79	82	82
France	53	59	64
Italy	55	57	53
Poland	34	39	37
Spain	36	41	40
Turkey	41	68	89
United Kingdom	55	59	63

1) EU-28 = EU-25 plus Bulgaria, Romania and Turkey.
Source: United Nations.

more multicultural characteristics. With regards to the demand for food, this means a greater demand for products that are commonly consumed in the countries of origin.

Ageing population
Another important demographic factor is the ageing of the population: within the EU-15, 16% of the population is over the age of 65 years. The percentage of those aged 65 and over is increasing in all the EU countries, for example by 4.5% in the Netherlands (table 3.2).

Technically speaking, older people use up fewer calories. This would mean a decline in the amount of food required in the EU. A shrinking market often leads to intensified competition, which can put pressure on prices. On the other hand, older people have more free time and more opportunity to eat out, not only because the next generation of pensioners will be relatively wealthy but also because older people do not have to invest so much in their family, house and durable consumer goods. All in all, this can bring about an increase in turnovers, because more links in the chain are involved (changes in the sales channels).

Table 3.2

Demographic developments in the Netherlands and a number of other EU countries, 2005-2020

	Share of those aged 65+ (%)		Share of single person households (%)		Share of households with children (%)	
	2005	2020	2005	2020	2005	2020
The Netherlands	13.9	18.4	14.0	17.1	29.4	26.5
Germany	18.5	21.4	16.8	19.0	25.6	22.4
France	16.4	19.6	14.1	16.8	29.5	26.5
Italy	19.5	23.6	9.5	11.3	32.6	27.9
Austria	16.2	20.1	13.0	15.3	29.1	26.2
Sweden	17.3	21.5	20.1	21.6	27.4	25.3
United Kingdom	15.7	18.9	14.3	17.0	29.6	26.2

Source: Eurostat.

Young people have a different type of lifestyle: they are less constant in their purchasing behaviour and consume more snack-type products, for example. It is not inconceivable that the relative reduction in the number of young people could put pressure on the soft drinks market and the snack market, for example. Older people generally have a more stable consumption pattern. In this regard, the consumption behaviour of the current 50+ age group could form a good guideline for the expected consumption pattern of the 65+ age group of the future.

Participation of working women

The percentage of working women has increased greatly over the years. This has given them greater purchasing power and has also resulted in an increased demand for convenience food and/or ready meals. Only a slight increase in the percentage of working women is expected (Eurostat, baseline projections), and this factor is not expected to bring about a significant change in the demand for food.

Individualisation

Our society is becoming more and more individualised. This can be seen in purchasing behaviour, for example, through which people like to distin-

guish themselves from others. This can result in the formation of so-called mini-segments, not only for products, but also for points of sale with a particular image.
This individualisation can also be seen in the fact that average households are becoming smaller, partly due to an increase in the number of single person households (see table 3.2). This development will probably result in an increased demand for greater diversity (allowing people to distinguish themselves from others) and for smaller pack sizes.

Families with children
The developments sketched here mean that the share of families with children in the total demand for food will fall. It is well known that children play an important role in the purchasing decisions of family households – whether or not influenced by television commercials – particularly with respect to products aimed specifically at children, of course, such as biscuits, sweets, ice cream and hamburgers. Additionally, dual income households and single parents appear to give in to the wishes of their children more easily than parents from more traditional families. The number of 'traditional' families is expected to decrease in relative terms. This would mean an even greater influence of children on consumption patterns.

Sociological and psychological aspects
The taste and preference structure of consumers is determined by a multitude of related social and psychological factors, for which we use container concepts such as habits, attitudes, values/norms and lifestyle. These are more difficult to measure than age or sex (although they are related to these) but they can greatly influence the development of the demand for certain foodstuffs or ornamental products.
The described changes in family situations are therefore connected with the reduced amount of time spent on cooking, resulting in more chicken and ready meals being sold, for example. On the other hand, there is also a renewed interest in food in relation to food production. This interest can be seen in the 'slow food' movement, increased interest in regional products, organic products and products produced in an animal-friendly manner. Contact with other cultures (on holiday, for example) has contributed to the gradual substitution of potatoes with rice, pasta and pizzas. The consumption of bread also suffered with the rise in the consumption of snacks.

Health
The increased attention devoted to health is a separate socio-psychological trend, also connected with prosperity and the ageing of the population, for example. This trend may result in an increased demand for products produced in a more natural way, fresh produce, diet products, low-fat and low-sugar products, decaffeinated coffee, non-alcoholic drinks and other products with health-promoting claims (whether or not substantiated).

Knowledge
The educational level in western countries is still rising. The expectation is that the majority of Dutch breadwinners will have a higher education qualification (university or higher vocational education) by around 2010. In general, a higher educational level means that the consumer takes in and understands information better and faster. This can result in more critical and more conscious consumer behaviour. The rise of new media such as the internet can further reinforce this process.

3.2.4 Conclusions

Continued economic growth is expected over the coming period in almost all regions of the world. This growth will be considerably greater for most of the transitional and developing countries than for the EU-15, the United States and Japan, in particular for Brazil, China, India and the new EU member states.
The world's population growth will fall to about 1% in the coming ten years. Around 75% of the world's population lives in developing countries, and this share will increase even further. The global demand for food will be determined more and more by the development of incomes per capita and less by the growth in the population. For the richer countries, an even higher income does not mean a greater demand for food.
Although China will probably increase its imports of agricultural products, the expectation is that China will continue to be able to feed its population itself to a great extent. There are opportunities for the Netherlands for exports and investments in the field of horticulture, intensive livestock production and, to a lesser extent, dairy farming.
Incomes in Europe are expected to increase slightly over the coming years, while the population is expected to remain reasonably stable. In terms of demographic composition and lifestyle, important changes are expected: more immigrants, an ageing population, more working women, more single person households and a reduction in the number of children.
In connection with the level of prosperity and the continuing individualisation, the demand for agricultural products is likely to diversify, on the one hand due to increasing immigration and familiarity with other cultures and new possibilities, and on the other hand due to the increasing need for variety, perception, convenience, health, quality and image.

3.3 Trade policy and agricultural policy

3.3.1 Introduction

Dutch agriculture and the agricultural sector (the 'agro-complex') are greatly influenced by international policy developments. The large share of exports and the dependency on imports of raw materials and products are an indicator of this (see 2.2). Most of the agricultural sectors produce mainly for foreign markets, and approximately 80% of those exports remain within the EU. The recent and future enlargements of the EU increase the scale of this internal market and therefore also offer opportunities for further export growth within Europe.

In addition, the markets outside Europe must not be forgotten, even if only because the population size and the purchasing power will grow fastest there. However, access to those markets is determined to a great extent by commercial policy instruments: import duties, non-tariff import rules and export subsidies. Multilateral agreements have been made within the framework of GATT/WTO regarding these commercial policy instruments since 1994.[2] These agreements have important consequences for the way in which the EU will need to reform its protective agricultural policy. This section looks at the implications for the agricultural sector of the WTO agreements and the reforms of the European agricultural policy.

3.3.2 WTO and other international agreements

Agriculture was an important topic in the GATT debates during the Uruguay round in 1994. Various issues were discussed – including services – but in the end it was chiefly the agricultural negotiations that proved to be crucial for the success of the round as a whole. The EU and other countries with a 'protective' agricultural policy came under fire from the United States and a group of countries with major agricultural export interests (the so-called Cairns group, including Argentina, Australia, Brazil and New Zealand, along with a number of other countries). The obstacle was the fact that the EU (with its very protective agricultural policy) was producing surpluses, which it was then selling on the world market at low prices (with export subsidies). Incidentally, the trade-distorting measures of other countries – such as the USA (cotton) and Japan (rice) – were also discussed. In the end, a number of agreements were reached, including:

- A reduction of import levies by an average of 36%, and only fixed levies would be permitted. (The EU had applied variable levies in order to fully protect the internal market from fluctuations in the world market prices).
- A compulsory minimum import rate of 5% of internal consumption.
- Reduction of export subsidies, both in terms of quantity (-21%) and in terms of subsidy budget (-36%).
- Reduced internal support (through the AMS formula), in particular less product-linked, trade-distorting support (in the so-called yellow or amber box).[3]

These agreements were implemented between 1995 and 2000. Together with earlier modifications of the European agricultural policy – such as the milk quotas of 1984 – they have resulted in a reduction of the EU share of the global market for grain, beef and a number of dairy products, for example. The growth of European agricultural production was reduced to barely 1% per year in the period 1995-2003, and the share of agriculture in the total imports and exports of goods also declined. (Kuyvenhoven & Stolwijk, in Meester et al., 2005: 165).

Expectations of the Doha round

An agreement was made in Uruguay that negotiations on further liberalisation would take place immediately after the implementation period.

This commenced with the start of the Doha round in November 2001. These discussions turned out to be very complex, concerning a great diversity of topics, and the number of participating countries has grown to approximately 150. Moreover, more countries are grouping together, such as the 'rising' countries (the G20 including China, Brazil and India) and the smaller developing countries (G90). This means that the US and the EU no longer have the same level of control. The hope is that agreements can be reached in Hong Kong at the end of 2005 regarding a conclusion in 2006. In the field of agriculture, the focal points are once again export support, internal support and market access. With regard to export support, the aim appears to be complete dismantlement. The EU submitted proposals in this regard back in 2004, albeit under the express condition that the US also give up its export credit programmes. There also appears to be a need to radically reduce internal support, at least insofar as such support distorts trade. The EU assumes that its farm payments introduced in 2003 do not distort trade (see section 3.3.3). Furthermore, market access will be increased through the further dismantlement of import tariffs, for example. The extent of tariff reduction (speed and period) will be partly dependent on the agreements on non-agricultural products.

Liberalisation of trade: will Brazil be the main winner?

The economic effects of further trade liberalisation in agriculture are generally assessed in a positive light (Francois et al., 2003). If the OECD countries were to completely abolish governmental support and import tariffs, global prosperity would increase by between 60 and 130 billion dollars per year. Both developed and developing countries would profit from this, the rich countries benefiting more than the poorer countries. The World Bank has also looked at how such a complete liberalisation policy would affect the rural population in the various countries. One country that could profit a great deal from a successful Doha round is Brazil.

Over recent years, Brazil has shown signs of rapid growth in various export markets (poultry meat, beef, sugar, soya) and has the opportunity to put considerable additional areas of land into production. Brazil's agricultural exports – amounting to over 24 billion dollars (2003) are already greater than those of Australia, for example. Further growth appears to be possible in sugar and soya. Brazil's most important export markets are the EU, the US and to an increasing extent Asia (China). The growth of beef production will mainly be absorbed by the domestic market (180 million people). Due to the strong growth of domestic consumption, the poultry sector will also export less, although exports to the EU will continue to increase.

Other conditions for trade

Where the liberalisation of trade is concerned, the conditions that countries impose on each other are also important, for example in the field of food

safety and animal/plant diseases. The so-called SPS agreement[4] was entered into within this framework. The essence of this agreement is that trade restrictions must be based on objective scientific principles and that the aim should be international harmonisation of the rules in this area. An important role in this is assigned to the so-called standard setting bodies like the Codex Alimentarius (Codex) for the protection of public health, the International Plant Protection Convention (IPPC) for products with plant-based origins and the Organisation for Animal Health (OIE) for animal products (Meester et al., 2005).
Agreements within the framework of the OIE (*Office International des Epizooties*) apply to the fight against contagious animal diseases (such as the recent outbreak of fowl plague in Asia). Countries not fulfilling these agreements should not be permitted to export animal products. However, the problem is that this agreement is not binding, meaning that some countries can make additional veterinary demands. In this way, the Dutch dairy sector encountered difficulties in its exports for a long time following the outbreak of foot and mouth disease in 2001, whereas the OIE agreements had been complied with a long time previously.
It is important that a binding 'Dispute Settlement Understanding' is provided for within the WTO with – if necessary – a panel and appeal procedure. Judgements within this context can have far-reaching consequences. This was the case for the European sugar policy in 2005, and the EU was urged to permit imports of 'hormone meat' from the United States.

Consumer concerns
'Non trade issues' or 'consumer concerns' can also become issues within WTO negotiations, such as rules regarding working conditions, the environment and animal-welfare. Although the EU has raised this topic, it is doubtful whether this will lead to concrete agreements: many countries see such rules as an attempt at improper market protection. For the EU, it is an opportunity to keep the 'European agricultural model' (relatively small in scale compared with large-scale exporters) on its feet and to achieve social conditions (such as sustainability). Within this framework, the WTO could ask the United Nations to further elaborate UN agreements within the context of the UNEP (environment) and the ILO (labour), for example. One problem with this is that not all WTO members have recognised and ratified the agreements concerned.

EU trade preferences
Alongside the multilateral trade agreements within the GATT/WTO context, the EU has various trade agreements with individual countries or groups of countries. In such cases, there are usually special advantages (preference) for the countries concerned with regard to their exports to the EU market. Such agreements include the Lomé Convention with around 75 ACP countries (African, Caribbean and Pacific countries) as well as agreements with a number of Balkan countries and Mediterranean countries. A few years ago,

preference was also given to the 49 poorest developing countries within the framework of the Everything-But-Arms initiative (EBA). Such preference relates mainly to sugar, beef and a number of horticultural products, including tomatoes. Imports of cut flowers from Kenya and Columbia are thus exempt from import duty and the EBA countries will be given free access to the European sugar market as of 2009. According to the European Commission, this could lead to considerable growth in sugar imports. In June, within this framework, the Commission proposed a radical modification of the sugar policy in order to make the sector more competitive in preparation for this. The trade preference policy was partly a consequence of the enlargement of the EU. For example, upon the accession of the United Kingdom, New Zealand gained the opportunity to continue exporting over 100,000 tonnes of butter to Europe. When the ten Central and Eastern European countries acceded to the EU in 2004, the EU also took on certain existing agreements. In the future, the significance of the preference system will gradually decline as the EU's import barriers (tariffs) are lowered due to new WTO agreements. For this reason, not all developing countries are happy with the idea of fast liberalisation, as demonstrated by the discussions regarding sugar. Moreover, a number of preference countries (such as certain Balkan countries, with regard to beef and sugar) could form part of the EU themselves in the future. The one-sidedness of the preference would then expire.

3.3.3 EU agricultural policy

Enlargement of the European market

The continuous enlargement of the EC with its six original member states into the EU (with potentially 30+ member states in 2015) means that the internal market will have more than doubled within the space of a few decades. Although the most recent accession countries are or will be on average less prosperous (or even much less prosperous) and are situated further away in geographical terms, the effect of this market expansion for the Dutch economy and the agricultural sector is unquestionably great. For example, exports to the United Kingdom (acceding in 1973), Greece (1981), Spain (1986), Sweden and Austria (1995) grew strongly after their accession, and trade with the new accession countries Poland and Hungary has also increased fast. Of the countries mentioned above, only Spain has turned out to be a formidable competitor, particularly in horticultural products and pork.

Of the ten countries that acceded in 2004, competition is currently only expected in the field of vegetable products (open field vegetables, mushrooms and possibly starch potatoes). The grain harvest in the EU-25 was so large in 2004 that a major surplus arose, particularly in the new EU countries. Within livestock production, the competitiveness of the new member states remains modest at present, mainly because those sectors require greater investment in production, processing and sales. The most competition is expected in the poultry sector.

In the first year following accession, incomes in agriculture rose very strongly

Table 3.3

EU decisions and world market prices

Product	MacSharry price reduction (1993-1996)	Agenda 2000 price reduction (2000-2002)	Mid Term Review price reduction (2004-2007)	EU price 2004 (€ per tonne)	World market price (€ per tonne)
Wheat	30%	15%	0	100	100 [d]
Beef	15%	20%	0	1,560 [b]	1,500-2,000 [e]
Butter	0	0	25%	2,464 per 1/7/2007 [c]	1,400 [d]
Skimmed milk powder			15%	1,747 per 1/7/2006 [c]	1,700 [d]
Sugar	0	0	33% [a]	632; 421 in 2007/2008	250 [f]

a) Proposal dated July 2004 led to a reduction in the current intervention price from € 632 to € 421 per tonne of white sugar in 2007/2008; the market price in the EU is still over € 700;
b) Intervention price; basic price in the EU regulations is € 2,224; the European market price in 2004 was approx. € 2,800 per tonne of carcass;
c) Intervention price set by decisions taken in 2003;
d) Expectations of the European CIE and OECD are given in dollars; in € depending on the exchange rate (currently approximately €/$: 1.3/1);
e) FAO; Annual Averages, Beef (Australian, cow beef, boneless, cif, USA) Year 2003 US$/tonne 2,110;
f) the average export price of white EU sugar is € 223 per tonne in 2002/03 and € 280 in 2001/02.

in most of the new EU countries. This was the combined result of higher prices, the new EU payments and a larger harvest following the drought of 2003. This may provide an extra impulse for investments and production expansion. The new countries have the advantage of a plentiful supply of relatively cheap labour (unemployment in rural areas is often very high) and of cheap land. At present, however, they do not have an efficient infrastructure (knowledge, supply, sales, processing), and the production levels per hectare and per animal are still low. The enterprises in many countries are still inefficient. They are often too small (e.g. in Poland) or too large (a legacy of the old centrally-run economy), with arrears in investments and shortcomings in their management.

From market policy and price policy to rural policy and income supplements

Partly due to pressure from GATT/the WTO, the European agricultural policy has undergone major reforms in recent years, and this process is set to continue.

Firstly, there is the matter of the reduction in the guaranteed prices for grain, beef, dairy and probably also sugar (table 3.3). In the Netherlands, these products account for over 80% of the area under cultivation (including grassland and fodder crops). In other countries (with less horticulture and free arable crops), that proportion is generally much higher. In economic terms, the share of 'reform products' is much lower in the Netherlands: approximately 30% of the production value of agriculture and horticulture. This is because the Dutch horticulture, pork and poultry sectors are relatively large. In other EU member states, this share is generally over 50%.

It should be noted that the modification of the grain policy has had a relatively strong influence on intensive livestock production in the Netherlands. The Netherlands had the advantage of the 'Rotterdam gap', i.e. the supply of cheap (and tariff-free) feed raw materials. Now the European grain prices have remained close to the world market prices for a number of years, this relative advantage has been largely exhausted.

The relationship between the current European prices and the world market prices varies greatly per product. For grain, the EU is already competing at more or less the same level. Generally speaking, this means that exports without refunds appear possible. For beef, the current internal EU prices are higher than the world market price. A direct comparison is difficult in view of the differences in quality. Incidentally, the EU's self-sufficiency for beef has fallen below 100%, due to the decline in the number of dairy cattle (due to milk quotas). The abolition (decoupling) of the beef premiums could result in a further reduction in production. The internal butter price is currently still too high for exports without refunds to be possible; the difference is smaller for skimmed milk powder. For sugar, the proposed price reduction by no means ensures a bridging of the difference with the world market. Furthermore, in view of the pressure from many other countries, the EU has to choose between a far-reaching price reduction or a reduction in production. Account must be taken of the interests of imports from developing countries (EBA, ACP) and the Balkan region, as well as the isoglucose scheme (a grain-based sugar substitute).

The above indicates that the EU has not yet achieved the ultimate objective of full liberalisation for all products through modifying the prices. Schemes restricting production (dairy, sugar, etc.) will continue to be necessary until this is achieved.

Income payments

Income payments will be awarded in order to compensate for the reduction in the guaranteed prices. Up until the Mid Term Review decisions (2003),

these were linked with the quantity of crops grown and the number of animals kept. Due to this link, they did in fact form a type of premium on production. Partly due to pressure from the WTO, these premiums were therefore 'decoupled', though not fully for some products (starch, meat, etc.). The payments will make up a large share of the income of many cattle farms and arable farms – generally more than half – and are therefore significant for the continuity of these holdings.
For the time being, individual historic rights will form the basis for the award of the payments in the Netherlands (i.e. based on the past scale of production). Producers who used to receive a lot of price support will now be awarded a large payments. A number of other member states are already occupied with introducing a flat rate: an equal payments per hectare. This is disadvantageous for holdings that used to supply a lot of 'payments products' (such as intensive dairy farms) and advantageous for holdings that did not supply payments products (such as horticultural holdings). A kind of redistribution of income is therefore taking place. A flat rate is simpler in administrative terms as has fewer consequences for the land market (all land carries the same supplement entitlement). The longer ago the reason for the payments (the price reduction), the fairer such a flat rate policy becomes, relatively speaking, all the more so because the intention is to bring the so-called 'cross compliance' conditions further into the foreground.

Conditions for payments
The right to income payments is connected with certain conditions: cross compliance. A number of European guidelines – regarding nature and the environment, the welfare and health of animals, and food safety, for example – form the basis for this. This could be summarised as the 'good management' of green space. It is not yet clear exactly how these conditions will be applied and upheld, but the expectation is that these will play an important role in the political defence of the relatively high costs of the payments.

Incomes in agriculture under pressure
Since a global compensation of around 60% of the price reduction has so far been assumed in the determination of payments 60%, the (direct) effect of a reduction in income for the holdings concerned is obvious. A direct loss of income of on average € 6,000 has been calculated for dairy farms (De Bont et al., 2003). The EU proposals for sugar in mid 2004 mean an average income reduction of over € 3,000 per arable farm; the recent proposals (June 2005) have an even greater impact.
Holdings try to absorb this by means of cost savings, increasing productivity, etc., resulting in an extra stimulus for increases in scale. Since the reforms have not yet been fully implemented, this will also be the case for the coming ten years. In addition, account needs to be taken of the domino effect of price reductions of the mentioned products to other products.

Budgetary conditions
The transition of market and price support to payments means a clear increase in European agricultural policy-related spending. Since the introduction in 1993 of the first reform decisions, the expenditure on grain and oilseed (hectare premiums) and beef (animal premiums) has risen considerably. The proposed milk premiums (€ 35.5 per 1,000 kg) are also likely to cost more than € 4 billion, while the dairy policy cost less than € 2.8 billion in 2003. This seems strange as – globally – only 60% is compensated, but in the case of market and pricing policy, the coffers are only opened for the 'surplus' litres (export repayments, intervention) and the European consumer contributes to the support through the inflated prices. The share of agriculture in the total expenditure of the EU remains relatively high due to the transition to the payments system (approximately 40%).
Figure 3.3 presents the financial prospects proposed by the Commission for 2007-2013. This proposal was not accepted by the Council in June 2005. In previous agreements regarding financial discipline, the ceiling for the agricultural guarantee expenditure (1st pillar), effective until 2013, was set at around € 43 billion. This could prompt (extra) cuts on the payments, for example to release extra funds/agricultural funds for the accession of Bulgaria and Romania or for the reforms to the sugar policy. In any case, no correction for inflation is applied to the payments. This means that holdings will need to try other ways of keeping their incomes at their current levels. In cases of increases in scale and a reduction in the number of holdings, the average payment per holding is gradually increasing.

Consequences for production and market
The switch from price support to payments will probably have little effect on the total agricultural production. Only in marginal areas – where the production costs are relatively high – will the lower prices form a reason to stop. This will mainly have an effect on the production of beef and lamb. In better areas, holdings that feel obliged to stop will generally be taken over by more efficient holdings. Incidentally, the cross compliance conditions can also encourage further increases in scale and specialisation: as they will bring with them extra investments and extra costs (per product). In principle, farmers and horticulturalists can decide to switch to another product with a higher balance per hectare while still retaining their payment. In this way, they could be seen as 'unfair' competition for producers of free products (such as potatoes, vegetables and fruit). In order to prevent this, no 'free products' may be produced on hectares for which such payments are received.

Rural policy
The European Union's rural policy forms the 'second pillar' of the agricultural policy and aims at:
- the reinforcement of the competitiveness of agriculture (and forestry),
- the sustainable management of the rural area,

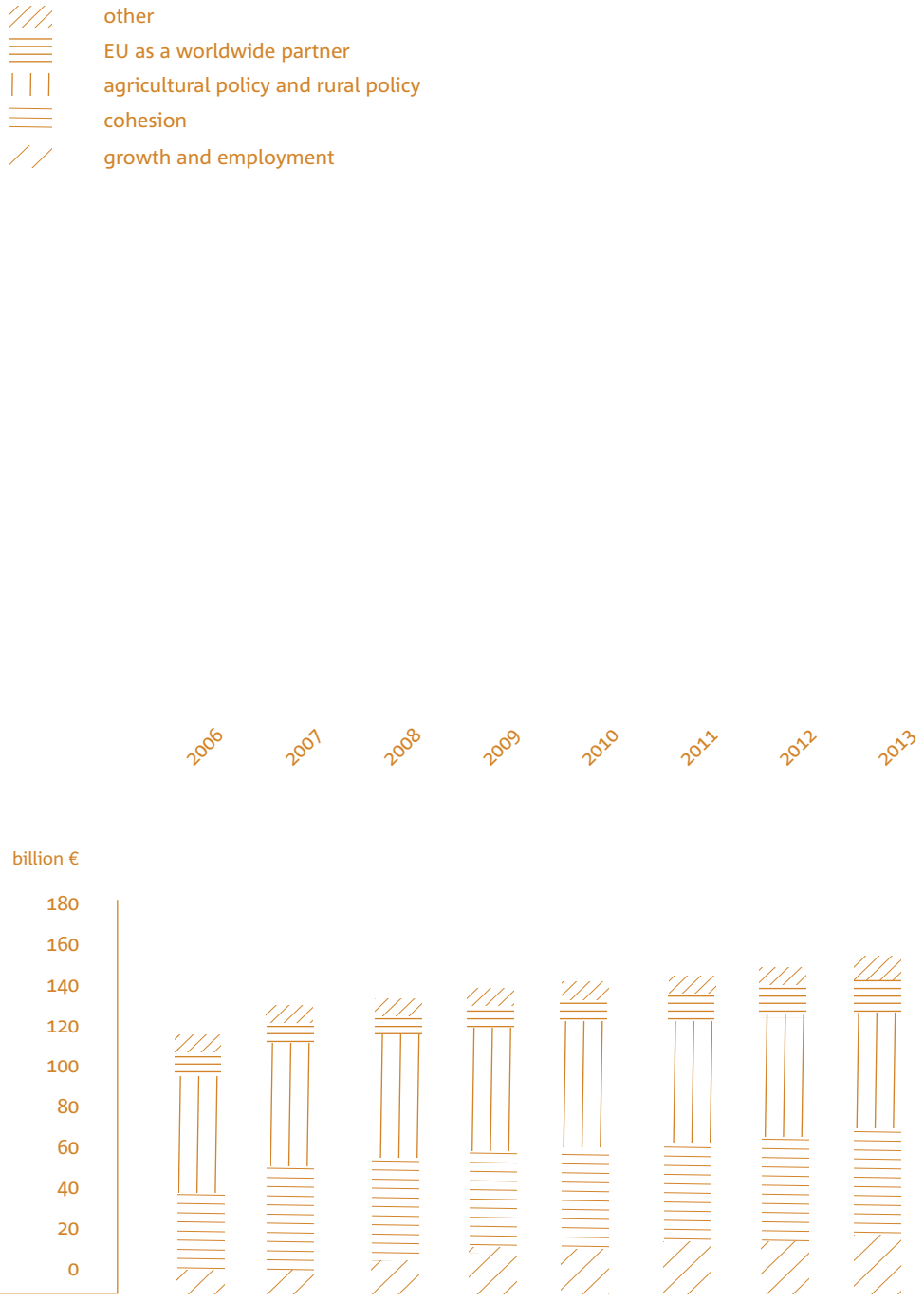
– the diversification of agricultural activity and the rural economy, and
– the improvement of the quality of life in rural areas.

On the basis of European rural policy, countries formulate domestic programmes, the so-called rural development plans (POPs). In the years 2000-2006, over € 1 billion was spent on this in the Netherlands, of which 40% was paid by the EU. For the joint financing of the rural policy, the EU has made extra resources available from a separate fund: the European agricultural fund for rural development (EAFRD). This is separate from the European guarantee fund for agriculture, from which the payments are paid, for example. An increasing sum is transferred from the European guarantee fund to the rural development fund by means of gradual cuts (modulation). This applies under the pre-condition that the Council accepts the proposed financial prospects.
In the Netherlands, the emphasis has so far been placed on sustainable management of the rural area. The effect of the rural policy on the structure of the holdings is expected to be limited. The financial incentives will lead to a certain amount of extra broadening (such as agri-tourism and care farms) but ultimately it will mainly be the market that determines the extent of this type of broadening. For nature and landscape conservation, the Netherlands already has its own policies (since 1980): the *relatienota* (Policy Document on Agriculture and Nature Conservation) and the *ecologische hoofdstructuur* (national ecological network). This policy can be extended with the supplementary EU resources.

Environment, welfare, health and food safety
Within the framework of the European integration process, more and more government policy matters have been transferred to Brussels over recent decades, thus making national governments primarily responsible for the implementation of that European policy. Over 85% of the regulations of the Ministry of Agriculture, Nature and Food Quality are at least influenced by Europe (Meester et al., 2005:30). In the field of the environment, the policies concerned are the Nitrate Directive, the Directive establishing a framework for Community action in the field of water policy and – for the larger intensive livestock farms – the Integrated Pollution Prevention and Control Directive (IPPC). The authorisation of the use of pesticides is increasingly becoming harmonised within a European context. Environmental policy is addressed in more detail in section 3.4.
In the field of veterinary science, stricter European rules on matters like the transportation of animals and the use of meat meal have been put in place since the BSE (mad cow disease), swine fever and foot-and-mouth disease crises. A number of regulations have also been introduced regarding animal welfare. For example, since 2004, there has been a ban on individual box stalls for veal calves, and the keeping of laying hens in battery cages will be banned as of 2012. With regard to food safety, the EU has designed new legislation: the General Food Law. Within the member states, the

Figure 3.3

Financial perspectives (in billion €) of the EU by objective (Commission proposal), 2007-2013
Source: European Commission.



implementation of this leads to changes in the control over the chains and new organisational and financial relationships (the Food and Consumer Product Safety Authority (VWA)).
As long as they are respected, most of these rules have a harmonising effect on the competition conditions (a 'level playing field'). In addition, they result in costs that can vary by holding and member state, depending on the starting position. For example, the Nitrate Directive has much greater repercussions for the Netherlands than for countries with a very low concentration of intensive livestock farms. The same applies to the crop protection policy, as the Netherlands grows a relatively large number of crops requiring above-average use of pesticides. A ban on such pesticides or a limitation of their use would have much more drastic consequences than in other countries. Moreover, the Netherlands with its abundance of water is also more greatly affected by restrictions on emissions and no-spray zones.
The number of intensive livestock farms in the Netherlands has been reduced considerably, particularly since 2000, thus also resulting in a reduction in the total pig and poultry populations (buying back scheme). This is why the effect of the European schemes will be relatively smaller in the Netherlands over the coming years. In particular, the application of use norms for the use of manure and minerals requires better management by holdings. However, this would also bring about extra costs for a certain proportion of the holdings, particularly regarding the sale of manure.

Quality policy
The European Union is essentially trying to make agriculture demand-driven through the policy changes described above. This also includes the improvement of the quality of the product and the production process. Matter such as cross compliance, the abovementioned measures for the environment, animal welfare and food safety, and the stimuli for organic farming fit into this framework. In addition, the EU offers opportunities for national quality labels and regional products (with geographical specifications).

National implementation is more important
Now the centrally regulated European market and pricing policy is gradually changing into rural policy and 'decoupled' payments, the importance of national implementation is increasing. That implementation must of course fulfil a whole range of European regulations, yet there is scope here and there for differences in national implementation.
Countries can therefore make a choice regarding the basis for the payments (historical reference, flat rate, or a mix of the two) or regarding the extent of 'decoupling' of the beef premiums, for example. Similarly, member states can use the resources earmarked for rural policy for regions (infrastructural facilities) and for agriculture or broader rural development. At present, it is unclear whether such national choices will have much impact on the mutual competitive relationships.

More and larger price fluctuations

Due to the reforms to the EU's agricultural policy, greater price fluctuations can be expected for a number of products. We have already seen this in the case of beef (for which prices fell to very low levels for a number of years following the BSE crisis) and grain (due to lower harvests, for example in the drought year of 2003). Over the coming years, a similar situation could also arise for dairy products and sugar, particularly if the quota restrictions are lifted and the production volume becomes more variable. The latter will apply particularly to beet sugar for which growers can decide on their production volume on an annual basis.

With regard to price changes on the world markets, the way that the large countries manifest themselves will be particularly important. Will demand from China increase as strongly as predicted? Will Russia remain a net importer? Can Brazil and other exporting countries meet the growing global demand? Climatological factors (such as drought and floods) can bring about unexpected price fluctuations. For animal products, outbreaks of animal diseases can suddenly result in extra price movements, such as was the case for eggs as a result of the fowl plague in 2003. It is important for the European market that the variable import levies have now made way for fixed (and declining) tariffs, and that the exchange rate between the dollar and the euro can change considerably over time.

3.3.4 Conclusions

International developments have a major influence on Dutch agriculture and the agricultural sector as a whole, which after all imports and exports a great deal. The WTO is particularly important with regard to international policy.

Agreements were made for the first time during the Uruguay round regarding the liberalisation of the markets for agricultural products. This means reduced export support and more conditions attached to internal support for agricultural production. A reduction in market protection will remain dominant for the coming years. The significance of trade preferences for particular countries or groups of countries will decline due to global liberalisation.

This liberalisation is interlaced with European agricultural policy. Further reforms are expected for products like milk and sugar in particular. Decoupled payments will play a major role for land based farms. In this regard, account must be taken of a relative decline (ceilings in EU expenditure) and desires for a simplification of the system. The changes in the policy, including cross compliance, will lead to further increases in scale. The fulfilment of these conditions is also of social importance in order to give the payments a lasting character. A kind of re-nationalisation could occur within the payment policy and the rural policy, but this would appear to have no overriding effect on the internal competitive relationships. Due to this liberalisation, developments in countries like China, Brazil and Russia will gain a greater influence on the relevant agricultural markets.

Brazil, with its great potential, could thus greatly expand its exports, whereas China and Russia could become major purchasers of agricultural products, under favourable economic conditions. However, in view of the possibilities for further production growth, partly through technological developments, the question is whether this will lead to an increase in the world market prices for agricultural products. We must also take account of more fluctuating prices – on the European market, too – as a consequence of liberalisation.
Within Europe, the enlargement of the EU is generally favourable for sales by the Dutch agricultural sector. In addition, regulations in the fields of the environment, welfare, health, food safety, nature etc are gaining in significance within Europe. Due to its intensive character, the environmental rules have a more restrictive influence on Dutch agriculture than in other European countries. The same can be said for rules relating to conservation policy. Compliance with regulations in the field of food safety and similar fields is a condition for access to the domestic and foreign markets.

3.4 Environmental and conservation policy

3.4.1 General

The environmental and conservation policy is a reflection of the social pressure on agriculture and horticulture: society values nature and landscapes, and expects the agricultural sector to accept its social responsibility in managing that nature and those landscapes. This throws up a dilemma for agriculture: managing the environment entails a lot of extra costs and restrictions, but on the other hand, prudent management can boost one's image, both in the eyes of the market and in the eyes of society.
This section looks at the most important environmental topics, investigating the extent to which the European and national policy objectives require modifications within the agricultural sector. A brief description of the implementation of the Council Directive on the conservation of wild birds and the Council Directive on the conservation of natural habitats and wild fauna and flora is also given.

3.4.2 Crop protection policy

Despite a strong decline in the use of pesticides (a decline of 50% over 15 years), the desired situation has not yet been achieved. Quality standards for surface water and groundwater are still frequently exceeded and drinking-water companies are consequently confronted with extra costs. Moreover, EU regulations (such as the Water Framework Directive, see below) will play an increasingly important role. All in all, the environmental impact of chemical agents in the Netherlands in 2010 needs to have been reduced by 95% in relation to 1998.
The current legislation is not transparent enough, partly due to various interim modifications. For example, the current implementation regulation has approximately 59 Orders in Council and decree orders. A new law is in the pipeline that will link up with the EU directives as far as possible, partly

due to competition considerations. The main intention is to simplify the regulations and to speed up the licensing procedures for new chemical agents.
One specific problem is that it is relatively expensive to develop new agents for small-scale crops, of which there are a lot in the Netherlands. This is why a '*Fonds Kleine Toepassingen*' (fund for small applications) has been set up, with funds trickling in from the government and industry.

3.4.3 Greenhouse gas policy and energy policy

The Kyoto protocol came into effect on 26 February 2005. The Netherlands has committed itself to reducing its total emissions of greenhouse gases by 6% during the period 2008-2012 (in relation to 1990). In view of the development of the issue of climate change, a tightening of the limits can be expected at some point.
In order to achieve the national reduction objectives, maximum emission levels have been formulated for 2010 for the various sectors of the economy. A ceiling of 7 million tonnes of CO_2 applies for agriculture and horticulture (i.e. not including the other greenhouse gases). This means a major reduction compared with the 8.1 million tonnes of CO_2 emissions in 2000.
The target values formed an important starting point for the free allocation of greenhouse gas emission rights to approximately 350 businesses, which together account for more than 90% of the Netherlands' industrial CO_2 emissions. The EU-wide trade in these emission rights began in 2005. The idea is that companies with greater CO_2 emissions than their 'entitlement' are forced to buy additional rights from companies with emissions that are less than their entitlement.
The primary agricultural sector will for the time being remain excluded from the trade in emission rights, with the exception of a few large greenhouse horticultural holdings. This sector could be affected indirectly since suppliers (such as the fertiliser industry and electricity companies) and purchasers (such as the feed industry and the dairy industry) *are* direct participants. If holdings need to purchase additional emission rights, they will endeavour to pass on the associated costs to buyers or suppliers. This will probably not happen in the next few years, but it could happen in the future if emission rights are limited and the price of those rights increases.

3.4.4 Minerals policy

The minerals policy has been radically revised on several occasions, and there are now proposals for new changes. The current system of manure production rights and animal rights will continue to exist. A maximum will be set for national manure production. The buying up of these rights by the government over recent years made a significant contribution to the reduction of the production of manure.
As a consequence of a judgement passed by the European Court, a proposal has been put forward to abolish the MINAS system (Dutch Mineral Accounting System) as of 2006 and to replace it with a system of usage norms in

accordance with the rules of the Nitrate Directive. These usage norms are different for each crop and relate to animal manure and fertiliser combined. In addition, there will be a separate norm of 170kg of nitrogen per hectare from animal manure. Holdings with more than 70% grassland may however use 250kg of nitrogen from animal manure on the grounds of the so-called derogation, though still complying with the norm for the total amount of nitrogen used per hectare. For phosphates, a usage norm of 110kg/hectare will apply to grassland in 2006 and a norm of 95kg will apply to arable land, including phosphates from fertiliser. The norms will be gradually lowered until 2009. An evaluation of the derogation will take place in 2008, with the nitrate levels in the groundwater being of particular importance. If these levels do not fall sufficiently over the next few years, or if they increase, it is uncertain whether the derogation will be extended.
The introduction of usage norms will not lead to any noteworthy national manure surplus in 2006. A surplus of 10 million kilograms of phosphate and 18 million kilograms of nitrogen has been calculated for 2009. However, this estimate is uncertain. Optimistic assumptions foresee no surplus, but if things work out badly, the figures mentioned could be doubled. This is partly dependent on the extent of the acceptance of animal manure by arable farmers, sales outside Dutch agriculture, the possibilities for manure processing, the area of land used for the various crops and the changes in the livestock population. The surplus will need to be eliminated one way or another through the market. After 2009, in accordance with the policy intentions, the usage norms for phosphate will be tightened enough to achieve an equilibrium of fertilisation. The manure surplus could then mount up.

Water Framework Directive
The European Water Framework Directive, which was laid down in 2000, is aimed at raising the quality of surface water and groundwater to a 'good level' and keeping it at that level. In principle, this objective should be reached by 2015, but there an extension of this deadline is possible. This is dependent on the so-called 'catchment area plans', which must be ready by 2009. In these plans, the concept of 'a good level' may be interpreted according to the situation, meaning that account should also be taken of feasibility and possible economic consequences. For this reason, this directive will not result in large sections of agriculture disappearing from the Netherlands. However, the point is that the levels of nitrogen and phosphate in the surface water are currently around double the Water Framework Directive norms. Since approximately half of this quantity originates from agriculture, there is no chance of a relaxation of the minerals policy (beyond derogation).
The consequences of the Water Framework Directive for agriculture are still uncertain and are dependent on various choices that the Netherlands will need to make (Reinhard et al., 2005). What will the objectives be?

Will manure-free zones be chosen as the solution? How many metres? To what extent will the manure policy be tightened? With regard to the procedure, it is important that every country is able to apply for six years of derogation in 2015 if the targets are not reached, and a further six years if the country can demonstrate that it has done its best. In short, the Nitrate Directive currently has a regulatory character, but in the future the much stricter Water Framework Directive norms will take precedence.
In areas in which other relevant directives apply, the directive with the strictest objectives will take precedence. This is relevant for areas falling under the directives on wild birds and habitats. For these and other protected areas, an 'extra area-oriented' approach will be employed until 2015, forming part of the relevant catchment area management plan.

3.4.5 Ammonia and stench policy

Agriculture accounts for approximately 90% of the Netherlands' ammonia emissions. This share has changed very little in recent years. The EU has set a ceiling of 128 million kilograms in 2010 for the Netherlands. For agriculture, this amounts to 114 million kilograms, which would appear to be feasible. However, according to the Fourth National Environmental Policy Plan (*Nationaal Milieubeleidsplan-4*), a maximum of only 55 million kilograms in emissions is acceptable in order to protect the environment. If this figure is set as the ceiling, additional measures will be necessary, such as a further tightening of the conditions on the use of manure and of the norms on low-emission stalls.
In order to protect sensitive areas of nature, the ammonia policy has a spatial component. Zones have been designated, measuring 250 metres around vulnerable areas, in which intensive livestock farms may not increase emissions. The reduction of ammonia emissions in the vicinity of vulnerable areas was one of the reasons for the intention to relocate intensive livestock farms within the framework of the so-called reconstruction. However, relocating farms is very expensive and in most cases not the most cost effective measure for realising the objectives of the ammonia policy. The installation of elutriators is in many cases cheaper than relocating the farm. Incidentally, farm relocation can serve multiple purposes and can therefore be a justified measure.
Current stench legislation makes use of odour circles around livestock farms, within which no new residential housing may be built. In order to offer more possibilities for local 'tailoring' and the desired multi-functionality of the rural area, long-running debates are being held within the Cabinet and the Lower House of Parliament regarding a relaxation of this legislation. A new stench law is in the pipeline, due to be looked at by the Council of State in mid 2005. This means that this law will not come into force before 2007 at the earliest. The expectation is that on the one hand the new stench legislation will mean fewer restrictions for the expansion of livestock farms, and on the other hand it will offer more possibilities for non-agricultural activities – such as housing – in livestock farming areas.

3.4.6 Drying out

The drainage of agricultural land and the faster removal of the drained water from the area are estimated to account for about 60% of the drying out of areas of nature, compared with 30% due to the extraction of ground water for drinking water, industrial water and sprinklers. In the 1990s, the dried out area of land was estimated to be approximately 600,000 hectares. In 2000, this had fallen to around 490,000 hectares. In 2010, however, the dried out area of land must have decreased by 40% in relation to 1985. This objective cannot be achieved if the current rate of change stays as it is. Measures within the framework of the reconstruction of the intensive livestock farming areas could make a substantial contribution to reversing the trend of the drying out of land. For the agricultural sector, the anti-drying out policy means that a less favourable water level (in agricultural terms) must be accepted in certain areas, and that the use of sprinklers will be restricted. This will be accompanied by higher costs and/or lower yields. On the plus side, the sector can contribute to good water management, particularly through water storage, which will be compensated as a 'blue service.' This will offer new possibilities for some farmers.

3.4.7 The directives on wild birds and habitats

The objective of the EU Council Directive on the conservation of wild birds (1979) is the conservation of all species of birds living in the wild. To this end, the directive concerns not only the birds themselves but also their eggs, nests and habitats. The complementary Council Directive on the conservation of natural habitats and wild fauna and flora (1992) has the objective of protecting the habitats of designated plant and animal species other than birds, as well as protecting designated biotopes. Like the Council Directive on the conservation of wild birds, the Council Directive on the conservation of natural habitats and wild fauna and flora prohibits the capture, killing, plucking and uprooting of protected animals and plants, the possession of or trading in these, and the deliberate disturbing or destruction of the foraging areas, breeding/propagation areas or resting places of these animals and plants.

Both directives feature two forms of protection: area protection and species protection. The area protection takes the form of the designation of special protection zones ('directive areas'). The basis for the designation is formed by characteristic ecological features. The influence of the directive also extends to the direct surroundings of the protection zone (external effects). The exact definition of the 'direct surroundings' needs to be further elaborated per area, dependent on the characteristic ecological features and the nature of the threatening interferences.

The international obligations arising from the guidelines have only recently been translated into national legislation and regulations in the Netherlands. Due to the active involvement in the development of the directives, the Netherlands assumed that the existing legislation and regulations already complied with the directives on wild birds and habitats. This turned out

not to be the case, as demonstrated by a number of notices of default, a condemnation from the European Court and various warnings from the European Commission. In July 2003, the European Commission approved the designation of 141 directive areas in the Netherlands. More than 80% of these areas fall within the national ecological network. Approximately 40% of the ecological network areas are therefore also protected under the directives on wild birds and habitats.

3.5 Spatial pressure

3.5.1 Introduction

Dutch spatial planning policy has long been focused on allowing the Netherlands to be a country of 'compact' cities, towns and villages (built-up areas). The green areas between the built-up areas were protected by restrictive policy against suburbanisation. Residential housing outside these built-up areas was restricted and the economic, social and cultural support base of the built-up areas contribute to this.
Recently, however, the 'Vinex location' policy (sites designated under the 'Vinex', the Supplement to the Fourth Policy Document on Spatial Planning) has been the subject of particular criticism as the result is seen as too dull and too monotonous and as no longer meeting the requirements of the demanding housing consumer. In response to this, the government has made a turnaround in its 2004 *Nota Ruimte* (Spatial Policy Document), switching to a less restrictive spatial policy. The question is what this turn-around could imply for the urbanisation pressure on rural areas and therefore also the implications for the agricultural sectors.

3.5.2 Land use and spatial planning

Agriculture still covers two-thirds of the land in use in the Netherlands (see table 3.4). Within the EU, this figure is on average only 40% (source: Eurostat). However, the area used for agriculture in the Netherlands has been shrinking faster in recent years than in the countries around the Netherlands. This is related to the demographic pressure and the buying up of land for the national ecological network. Between 1996 and 2000, the total area under cultivation has declined by 34,000 hectares, being used instead for built-up areas or planned areas of development (25,000 hectares) and nature and recreational areas (8,000 hectares). For the coming period, a further decline of 0.35% per year is expected. This would result in the area under cultivation still being above 60% in 2020. Urbanisation is therefore a slow process.

The elaboration of the new *Nota Ruimte* (Spatial Policy Document) and the *Nieuwe Wet op de Ruimtelijke Ordening* (New Spatial Planning Act) will result in a certain degree of uncertainty. Previous spatial planning policy documents featured various forms of housing concentration. This has been abandoned in the *Nota Ruimte* and housing has been decentralised, to be taken care of by the provincial and municipal governments. The provincial

Table 3.4

Land use in the Netherlands, 1996-2000

Type of land use	1996 (hectares)	2000 (hectares)	% of total (2000)	change 1996-2000 (%)
Roads	112,503	113,040	3.3	0.5
Residential areas	213,770	221,141	6.5	3.4
Other built-up areas	91,055	97,190	2.9	6.7
Semi-built-up areas	37,780	48,573	1.4	28.6
Recreation (urban)	57,815	59,492	1.8	2.9
Recreation (rural)	28,352	29,386	0.9	3.6
Greenhouse horticulture	13,887	14,981	0.4	7.9
Other farming	2,346,494	2,311,066	68.4	-1.5
Woods and nature	478,396	483,464	14.3	1.1
Total land surface area	3,380,052	3,378,333	100.0	-0.1

Source: CBS.

and municipal governments will all do this in their own ways. It is possible that some municipal governments will decide fairly quickly not to develop their Vinex locations any further, based on the idea that these locations will soon not be able to compete with more rural housing. The new policy also gives villages the opportunity to expand. The expectation is therefore that the new policy will result in a 'palette' of smaller housing sites and therefore a more diffused form of urbanisation. For agriculture, this could result in the physical proximity of non-agricultural functions in more locations in the rural area, which could in turn result in more obstructions in term of environmental regulations and public enquiry procedures. It could also provide new opportunities for some entrepreneurs.
The *Nota Ruimte* is in fact more of an adjustment to the spatial planning policy than a radical departure from it: the State will continue to regulate matters in a generalised manner, and municipal governments will not gain a completely free hand in the development of construction locations.
The New Spatial Planning Act is based on development-based town and

country planning: this means that municipal governments (and other government bodies) formulate development objectives and put together a design. This is reviewed only at a later stage when third parties are also informed of the new plans. The form of involvement will change: instead of an opportunity to submit objections, a new 'outlook' will need to be discussed and decided upon. This will require more effort as well as continuous alertness to possible planning changes. 'Basic quality' will serve as a content-related criterion for the State in the reviewing of spatial developments. The interpretation of basic quality is not given; this will need to be made clear through case law. The *Nota Ruimte* indicates five Greenports and ten development areas for greenhouse horticulture. In addition, provincial governments must indicate agriculture development areas for 'non-land based and capital intensive agriculture.' Outside these areas, the development of this form of agriculture must be curbed. The potential consequences of this for existing development opportunities set down in municipal land use plans are as yet unclear.

3.5.3 Urbanisation

Around 76% of all buildings in the Netherlands are located within or very close to built-up areas, and 24% are outside these areas. There was an increase of 10% between 1996 and 2002. Of this, 22% could be accounted for by the rural area. Development in rural areas is densest around the large cities in the provinces/regions of North Holland, South Holland, North Brabant, North Limburg and southern Flevoland (figure 3.4). There is much more limited development in the provinces of Gelderland, Overijssel and Zeeland. Incidentally, this development took place under the restrictive spatial planning policy and is no reflection of the demand for new housing and employment sites.

Increasing development means that more non-agricultural activities can also be expected in rural areas, thus reducing the relative position of agriculture as an economic base – a position that is declining in any case due to the decline of employment in primary agriculture.

3.5.4 Living in the rural area

Town and city dwellers have a pronounced positive image of the countryside, characterised by notions of tranquillity, space, greenery, nature, a pleasant feel, and freedom. The idea of living in a rural environment is therefore an attractive one for many people: in an old farmhouse, in a newly-built home in a rural setting, or on the edge of an urban area – the so-called pseudo-countryside. A survey revealed that 70% of the urban dwellers with an inclination to move house had a preference for the latter option: a rural living environment in an urban area. Less than 20% wanted to move to what they considered the 'real' countryside. The potential demand for homes in rural areas is estimated at 60,000 to 130,000 homes. It is striking that the Dutch have a tendency to commute over greater and greater distances. Since the 1980s, those working in the Randstad urban

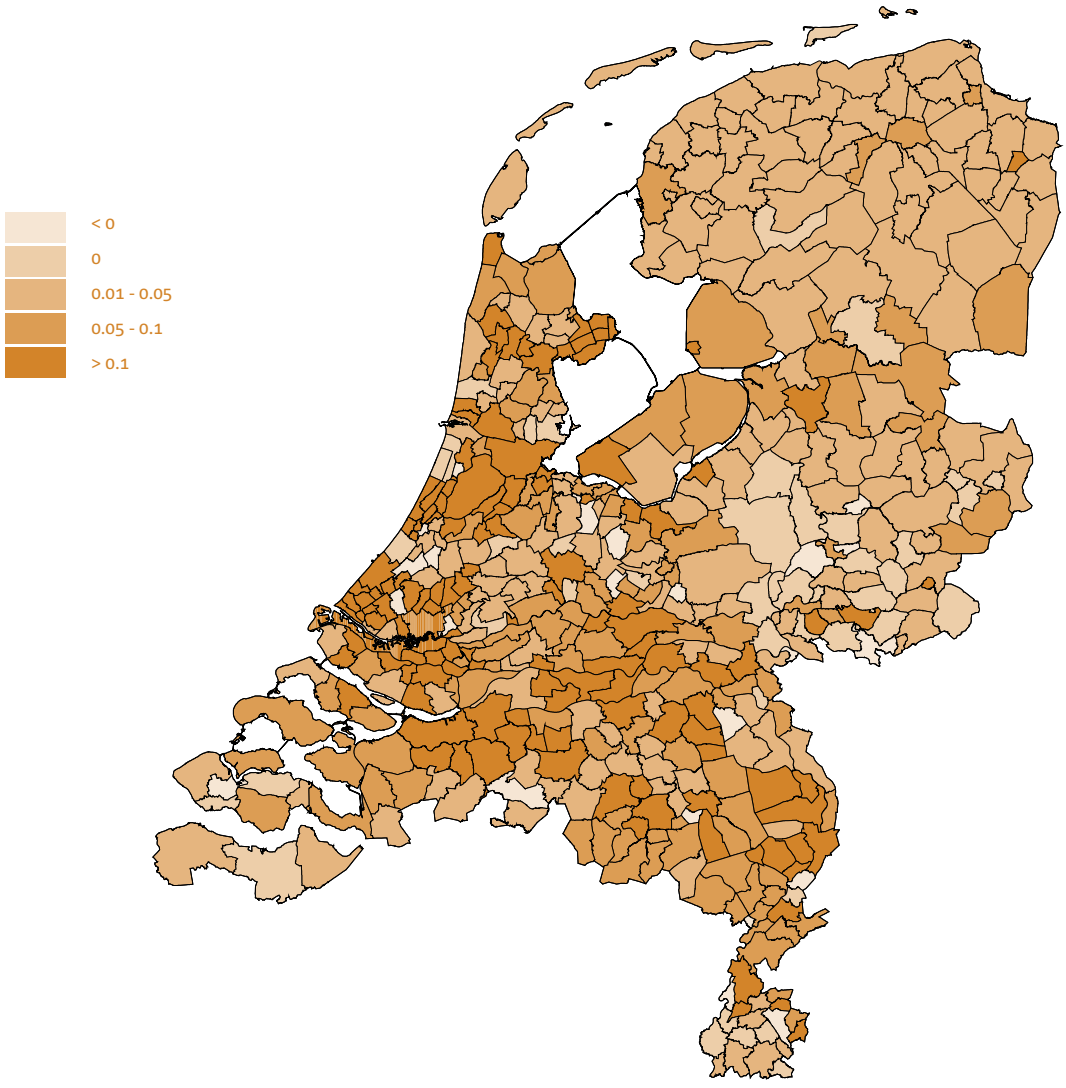
region have increasingly chosen to live outside the Randstad. In the 1970s, many people moved to urban growth centres close to the major cities, but the 1980s and 1990s saw an exodus to smaller, more rural towns and villages. The migration from the cities to rural areas takes place in waves. The flow in the other direction is much more constant.
There has also been a rise in the number of second homes in rural areas in the Netherlands. Factors in this trend include increased mobility, prosperity, free time (an ageing population) and the need for tranquillity, space and a green environment. According to estimates, there are now 380,000 second homes in the Netherlands. Of these, between 90,000 (CBS statistics) and 141,000 (Ministry of Housing, Spatial Planning and the Environment statistics) are designated as recreational dwellings, i.e. not intended for permanent residence. A large proportion of the second homes consist of caravans in permanent locations and chalets (120,000) and caravans in non-permanent locations (100,000). According to the CBS (Statistics Netherlands), the number of recreational dwellings increased by 22,000 between 1993 and 2003. Further growth in the number of second homes is being curbed by restrictions being placed on mortgage interest relief. Most recreational dwellings are located in or close to wooded areas or other areas of nature, at the coast and in the lake district of Friesland – and seldom in 'real' agricultural areas. An exception to this is the bulb-growing area in the province of North Holland.
The expectation is that the demand for rural living environments will in the future also be particularly visible in the immediate surroundings of towns and cities: the pseudo-countryside. This phenomenon will also increase elsewhere, not on a huge scale, but the effect can also be considerable in small villages. The demand will be concentrated mainly in areas with great natural value and particularly attractive landscapes such as south-western and northern Drenthe, north-western Overijssel, the *Achterhoek* region, the region of Twente, south Limburg, the southern islands of Zeeland and Zeeland Flanders.

3.5.5 Water

A whole range of processes such as the rising sea level, the soil subsidence, salinisation and urbanisation mean that the limits of the current water management system have been reached. In the new philosophy, the problems related to water are tackled not only by means of technical measures but chiefly with spatial measures. The total long term (2050) spatial demands for water amount to 600,000 hectares. Most of this requirement can be combined with the current uses of space, albeit with limitations. By 2050, 45,000 hectares of land would need to be converted into water (land-use change).
The Key Planning Decision '*Ruimte voor de rivier'* (Room for the river), literally gives rivers more space by means of moving dykes back, digging additional channels, digging out water meadows and lowering groynes. The decision will become effective once Parliament has granted its approval. This is expected to take place in mid 2006.

Figure 3.4

Change in built-up area (in hectares/km^2) in outlying districts per municipality between 1996 and 2002
Source: Alterra.



3.5.6 Land prices

Land prices are determined by two components: the land use value (or utility value) and the option value. The utility value is based on the expectation of the net returns that could be realised in the future from the use of that land. The option value is based on the expectation of capital gains if the land gains an urban land-use designation. The likelihood of urbanisation is therefore a factor influencing the price of agricultural land. Urbanisation thus also influences agriculture. Expansion of the farm acreage is thus made more difficult if the option value pushes up the land price. This phenomenon can be clearly seen in the vicinity of urban areas where only the intensive forms of agriculture (with high returns per hectare) can survive. The utility value of greenhouse crops is therefore much higher than that of arable farming.

The scarcity in the Dutch housing market and the demand for rural housing will keep construction intensity at a high level. If the new spatial policy offers greater freedom for construction in rural areas as well, this could lead to a 'distribution of the option value': a certain amount of levelling out in the sense that the option value will fall in places where it is currently still high, and vice versa.

Incidentally, the land price has fallen sharply over recent years in relation to the record level of an average of € 39,000 per hectare in 2000 and 2001. In the second half of 2004, the average price of unleased agricultural land was € 29,400. In 2003, one hectare of agricultural land in the Netherlands cost on average over € 32,000. The price varied between a little over € 22,000 in Waterland and neighbouring reclaimed land and € 48,500 in the IJsselmeer polders. The land price in Groningen is on average no more than 10% higher than the agricultural production value. In the IJsselmeer polders, the prices are high because both the utility value and the option value are high due to the growth of municipalities like Almere and the proximity of activities in the Randstad urban region. The utility value of the land is likely to fall in the future, particularly as a consequence of the expected decline in the price of agricultural products.

3.5.7 Conclusions

Urbanisation will continue in the future, even if just due to the growth in the number of households. The demand for space for recreational green areas, infrastructure and water management will probably grow at the same rate. The *Nota Ruimte* heralds in a more 'liberal' policy, in principle offering more space for the increasing demand for rural housing. In view of the preferences of the citizens, one can expect that demand to be primarily concentrated on the periphery of existing urban centres. Although more diffused urbanisation of the rural area will probably take place, the demand for this is fairly small, certainly in comparison with the total scale of the rural area. In this sense, the impact on the size of the area under cultivation will be very small. This area declines by a third of a percentage point each year, and this trend will probably continue.

3.6 Technological development

3.6.1 Introduction

The Dutch agricultural sector works with a high investment of labour and capital per hectare and thus achieves high productivity levels: a relatively high production level per production factor unit. This is a continuous development fed by new technical knowledge.

There are three important aspects attached to the process of technical development: the development of knowledge, the dissemination of that knowledge and its application. The development of new knowledge takes place in universities, research institutes and within industry. This can also include knowledge of a more general nature: the development of knowledge in the field of motors, materials, robots, ICT and biotechnology, for example, may not be specific to agriculture, but it is of great importance to the sector. The agricultural cluster has always been good at quickly absorbing new knowledge and adapting it so as to apply it throughout the sector. This is a crucial factor for success in terms of international competition. Practical research, amongst other things, has traditionally had an important role in this.

Technical innovations are divided into process innovations and product innovations. Product innovations focus on the improvement of existing products and the development of new ones. With process innovations, the production method occupies the central position. Within the agricultural sector, the process innovations have always had the upper hand, often resulting from product innovations in the supplying industry. For example, artificial fertiliser, new machinery and new greenhouse and stall systems have made new production methods possible. These examples indicate that there is a strong interaction between both types of innovation. One could also say that a product innovation such as a new type of stall comes into being as a result of the need for a different production method (such as low-emission production methods).

A new finding is not taken on board by everyone straight away. Many entrepreneurs prefer to see how things go first, fearful of potential 'teething problems' or not yet being ready to make the required investments. Moreover, the supplying industry is not able to able to supply everyone straight away. Promotional information provision and the mutual exchange of empirical knowledge in study clubs and growers' associations, for example, can speed up this process. Within this framework, there is also more and more fusion between the various links in the knowledge chain, so that opportunities, desires and modifications can be brought together quickly and effectively.

The challenges for technological development are many-sided. Firstly, process innovations remain important, both with an eye to the market (reductions in the cost price, food safety, transparency) and with an eye to the wishes and demands of the environment (the natural environment, wildlife, landscapes, animal welfare, the reduction of dependence on non-renewable resources, etc). In addition, the development of new products

can provide a significant competitive advantage. This section deals with a number of possible technological developments of importance for the agricultural sector.

3.6.2 Increase in productivity

Productivity can be increased by producing more with the same means of production and/or by economising on the production factors. In the past, the emphasis was placed mainly on achieving more physical returns per hectare or per animal. More productive initial materials, better feed conversion, more manure, new and more effective pesticides, etc. The focus was therefore more on the use of more external inputs per hectare. Partly in response to the environmental impact, the last few years have seen a reduction in this trend: the focus has shifted more towards economising on inputs.
A lot of technological innovation is also aimed at reducing the labour costs per product unit, through mechanisation and these days particularly through automation. This is true for the entire industrial column, for example in the distribution and processing industries (slaughterhouses). In many greenhouses and pig and poultry accommodation, the growth conditions are these days completely computer controlled. Only the care of the crops and the harvesting in the greenhouses still require a lot of labour. The next step would appear to be towards autonomisation and robotisation: the development of machines that can carry out numerous crop-related tasks independently. Two types of robots could be expected within the near future:

- Large robots (the size of tractors or combine harvesters) that can carry out numerous crop-related tasks independently. These will in many cases be machines that already exist but that are able to find their way around when weeding, spraying or harvesting with the help of a Global Positioning System (GPS).
- Small robots (ranging in size from large shoe-box size to small refrigerator size), able to carry out crop-related tasks very selectively and in particular patches. With the aid of sensors, these robots are able to make observations and take measurements independently (relating to the soil and the crop) and to interpret this data (with the aid of the necessary software such as crop growth models). On this basis, the robot 'knows' what he has to do to deal with a disease, infestation or weed or to help the crop in the correct manner. For the time being, such 'precision agriculture' will only be of commercial interest for crops with a very high added value.

It goes without saying that the abovementioned technologies will also be combined. For example, the large robots could also make use of plot information collected by satellite. In this way, it becomes possible to observe the state of the crop from space – including certain diseases and infestations. In response to such information, the robot can take the appropriate measures.

In greenhouse horticulture in particular, thought is turning towards intelligent 'greenhouse-chain concepts.' With virtually no labour, the growth of the crop is controlled, right down to the last detail (climate, growth medium, etc.), and in such a way that the result – in terms of quantity, quality and moment of harvesting – meets the wishes of the customer. Automation and robotisation are also the order of the day in livestock production. In cattle farming, for example, the automated milking system has been in use for several years (and mobile versions of the system may soon also be available), and pig farming is expecting an automated weighing and selection system for pigs in the near future.

3.6.3 Environmental technology

The application of technology can result in environmental problems, but technology can also offer the key to the resolution of those problems. After a period of 'cleaning up afterwards', these days there is a much greater focus on technology that can prevent environmental problems. Economics and ecology can go hand in hand, for example regarding economising on scarce resources such as energy and artificial fertiliser. There are three types of environment-technological solutions:

- 'End-of-pipe' solutions. Negative effects of the production process are corrected afterwards: discharge water is purified, the air is filtered (or 'washed'), and the soil is steamed.
- Process-integrated solutions. The occurrence of pollution is prevented or reduced. Examples include biological pest control, precision fertilisation and tailoring the composition of animal feed in order to influence the quantity and composition of the manure.
- System innovations. This involves taking an integrated look at the organisation of production. This can take place at chain level or in combination with other agricultural or non-agricultural sectors. A simple example is the closure of cycles through the mutual use of residual products: making use of waste from the food industry as pig feed; using industrial residual heat and CO_2 from oil refineries in greenhouse horticulture.

Saving energy is important both from an environmental perspective and an economic perspective. Within agriculture and horticulture, greenhouse horticulture accounts for around 90% of the total energy consumption. Solutions are sought in new greenhouse covering materials, for example, that can convert some or all of the incoming sunlight into energy. This can lead to greenhouses becoming a kind of energy supply.
Making good use of biomass – an important source of sustainable energy – will grow in importance over the coming years. In France and Germany, for example, this has also taken on major proportions, partly influenced by the EU directive on compulsory mixing. In quantitative terms, wind energy makes only a modest contribution, although there was impressive growth in the 1990s. Wind energy remains of interest with regards to the achievement of the national target of 12% sustainable energy resources in 2010.

In environmental terms, there are high expectations of biotechnology; for example, more efficient plants that require less in the way of inputs or that are optimally suited to specific circumstances; clean plants, of which all the waste is useable; 'resistant plants', resistant to diseases and infestations, thus removing the need for chemical or other forms of pest control. One particularly interesting innovation is the idea to produce vegetable food proteins directly using algae and solar energy (so-called blue biotechnology).
Other innovations with such perspective include:

- Bioremediation: the biological breakdown of environmentally harmful substances using bacteria, algae, fungi and yeasts or higher plants, for example. Bacteria have been used in this way for many years in the purification of waste water and in dealing with oil disasters.
- Technology to add value to residual and waste flows.
- Technology (including ICT) to optimise agrologistics.
- Ecogenomics: working towards healthier soil life.

3.6.4 Product innovations

A number of technological developments are a source of concern for consumers. Biotechnology is a salient example of this. In broader terms, people are concerned about food safety and there is a greater demand for quality guarantees and information regarding production methods. These are therefore important themes where the future prospects of the sector are concerned.
Product innovations take place on a regular basis in horticulture, such as the vine tomato, new colours of sweet peppers, and countless varieties of plants and flowers. In arable farming and livestock production, new products emerge much less frequently, although maize is an interesting example from the not-too-distant past. All sectors strive for improvements in quality. The post-harvest process is also important in this: storage conditions, the effective monitoring of micro-organisms that can cause food to perish and/or give rise to toxicity, and transportation conditions, for example.
The development of new products for the consumer generally takes place in the foodstuffs industry. Such products are generally aimed at consumers with greater purchasing power. The processing industry has a need for good quality starting materials (standard quality), and then wishes to create the added value itself by making specific products and supporting those products with a whole range of marketing techniques. The strategy currently predominating is one of more advertising and an emotion-focused approach.
However, another trend can be seen, towards products promoting health (functional foods): products with functional advantages such as probiotics, fat-substitutes, sweeteners and high-fibre products. These are products that are truly distinctive: a shift from 'emotional' to 'functional benefits.'
Developments in the field of preserving foodstuffs (heating, drying, deep freezing etc.) make it possible to supply high quality products that are highly nutritious, and have a short preparation time. New freeze-drying technology also makes it possible to combine convenience and authentic aromas.

This is important for the growing market for convenience food, ready meals and meals consumed outside the home. Work is also being done on new applications for existing products, such as the processing of starch potatoes into non-food products. Examples include the substitution of products that are based on petroleum (such as bioplastics), and other new 'bio-based' materials and products may also appear on the market. The question is whether crops will come into being that are specifically intended for non-food products and energy, or whether it will turn out to be economically more important to use crops partly as food and partly for non-food products: so-called biorefining.

3.6.5 Conclusions

Technology is continually offering new opportunities for responding to changing scarcity ratios, to environmental problems (such as problems associated with pesticides, greenhouse gases, minerals, ammonia and odours) and to existing and new consumer needs. There is far-reaching automation evident in all sectors, with heavy use of ICT and measuring and regulating technology. It is possible that more biotechnological innovations can also be expected in the Netherlands over the next decade.

Footnotes

1 Growth hypotheses are shrouded in the usual uncertainty. In the report entitled 'Four futures of Europe,' the CPB (Netherlands Bureau for Economic Policy Analysis) analyses the international environment on the basis of four possible scenarios for the future of Europe (see also chapter 1). The growth of the gross domestic product (GDP) varies from 0.6% in the scenario 'Regional Society' to 2.5% per year in the 'Globalising Economy' scenario.

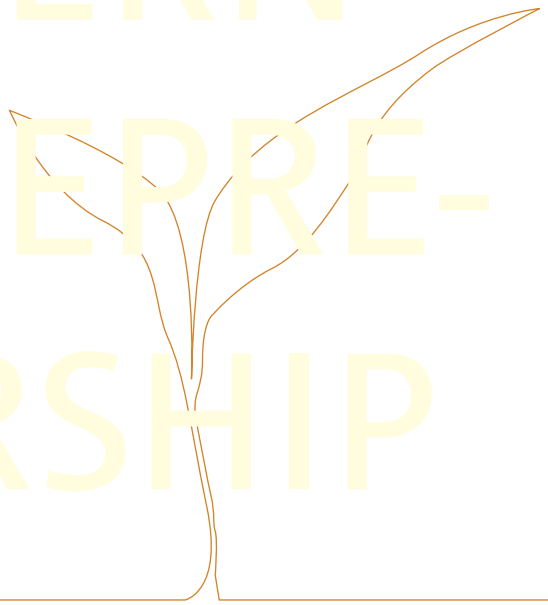
2 GATT = General Agreement on Tariffs and Trade; WTO = World Trade Organisation, the successor to GATT as of 1995.

3 Decoupled support in the form of education, research and quality policy (the green box) is exempt. Income payments (the blue box), such as the European MacSharry payments, are exempt for the time being on the condition that production is limited (by means of fallow land and quotas etc.).

4 Sanitary and Phytosanitary (SPS). This covers the fields of food safety, animal health, plant diseases and infestations. The following are also of importance:

- Technical Barriers to Trade (TBT). This comprise matters like technical specifications (labels, packaging etc.) that could obstruct free trade;
- Trade-Related Intellectual Property Rights (TRIPs). This agreement was designed to take care of intellectual property rights. An example for the plant-based sector is UPOV (*Union International pour la Protection des obtentions Végétales*).

A FLEXIBLE RESPONSE TO THE MARKET DEMANDS MODERN ENTREPRE-NEURSHIP



Chapter 4

Prospects for the agricultural sector

4.1 Introduction

What consequences will all the driving forces reviewed in the previous chapter have for the Dutch agricultural sector? *Are* there actually prospects for the sector? And, if so, are the various sub-complexes offered the same prospects? These questions have been answered using a reference scenario based on exogenous assumptions for the large number of uncertainties. To a greater or lesser extent these assumptions are based on the developments outlined in this report, and have been determined in consultations with the Ministry of Agriculture, Nature and Food Quality. The calculations required for the scenario were carried out using models, and with the assistance of experts at Wageningen UR.

The reference scenario is based on a modest growth of the Dutch and European economies, the WTO Doha Agreement whereby export subsidies are abolished and import tariffs halved, the reform of the Common Agricultural Policy in accordance with the Luxembourg Agreement, June 2003 (with an amendment of the sugar policy), and further implementation of the European environmental policy (see box).

The review begins with an outline of the overall agro-complex, and continues with separate discussions of the sub-complexes. The presentation of the results from the reference scenario also assesses the sensitivity of the results to national and international policy. This assessment is based on calculations for a number of alternative assumptions. The review is concluded with separate attention to the opportunities for the diversification of the agricultural sector, and the consequences these would have for the landscape.

Assumptions employed in the reference scenario

General

- 20% (real) economic growth in the Netherlands and the other EU-15 member states during the period between 2003 and 2015; economic growth will be greater in the (12) new EU member states and most other regions of the world (please refer to chapter 3).
- an increase of almost 5% in the population of the Netherlands during the years between 2004 and 2015. The increase is lower in the other EU-15 member states, and a decline is forecast in the new EU member states. The population will grow at a more rapid rate in other parts of the world, in particular in China and India (please refer to chapter 3).

Table 4.1

Added value and employment for the whole of the Netherlands and for the agro-complex in 2003 (in absolute figures) and 2015 (2003=100)

	2003 (absolute)	2015 (2003=100)
Production value [a]		
Total Netherlands	922	158
Agro-complex	63	114
(% agro-complex of total)	6.8	4.9
Added value [b]		
Total Netherlands	402	158
Agro-complex	24	114
(% agro-complex of total)	5.9	4.2
Employment [c]		
Total Netherlands	6,448	101
Agro-complex	397	88
(% agro-complex of total)	6.2	5.5
Added value/alu [d]		
Total Netherlands	62	156
Agro-complex	59	129

a) 2003: in EUR billion
b) at factor costs; 2003 in EUR billion
c) 2003: x 1,000 alu
d) 2003: x 1000 EUR
Source: CBS, processed by LEI.

Trade policy
- trade policy agreements within the context of the WTO Doha Round, inclusive of:
  - the abolition of export subsidies
  - the reduction of import tariffs by an average of 50%: 30% on regulated products and 80% on other products

Common Agricultural Policy (CAP)
- implementation of the June 2003 reform (MTR) relating to farm payments, i.e.:
  - half in the form of a flat rate payment (for all cultivated land), and half on an individual and historic basis

  - a 20% degression (creaming off for other reforms and the new member states) and a modulation (5% discount from payments of € 5,000 and more)
- dairy:
  - quotas will be maintained
  - a reduction of the intervention price (by 25%, with an additional 10% decrease)
  - ditto for skimmed milk powder (by 15%)
- sugar (EC proposals of 14 July 2004):
  - quota: minus16%
  - a reduction of the intervention price for (white) sugar to € 421 (from the current € 632) per tonne
  - a compensation payment of € 630 per hectare
  - inclusion in the farm payment
  - no exports of C sugar (3 million tonnes)

Environmental policy
- manure policy: Nitrates Directive: standards for nitrogen use (170 kg);
- Water Framework Directive: in accordance with the Nitrates Directive.

4.2 The agro-complex

4.2.1 Added value and employment

The reference scenario exhibits a further decline in the agro-complex' contribution to the national economy. Table 4.1 indicates that the growth in the sector's production value, added value and employment will lag behind the overall Dutch economy (cf. the indices in the last column). Within this context, the CPB forecasts a nominal 58% growth (i.e. not corrected for inflation) of the Dutch economy during the period from 2003 to 2015. More than half this nominal growth will be due to inflation. The growth of the agro-complex will be limited to 14%, and in 2015 the employment offered by this complex may be some 12% lower than the level of 2003. The CPB forecasts a 1% increase in employment for the whole of the Netherlands after account is taken of increased labour productivity.

The development of employment in the agro-complex depends on the growth in volume *and* labour productivity. The assumptions relating to labour productivity in particular can influence the results. It is expected that labour productivity will increase more in the livestock sector than in the arable and horticultural sectors, since the replacement of labour by capital is expected to take place more rapidly in the livestock sector.

The reference scenario reveals a nominal 9% increase in the added value of the arable-farming complex, but a 15% decline in employment. On balance, a slight decline is forecast in the sub-complex' share in the total agro-complex. The added value of the horticultural complexes would increase by more than 20% in the period between 2003 and 2015, as compared to 6% for the pasture-based livestock farming complex and 14% for the intensive livestock farming complex.

Table 4.2

Developments in added value (x € billion) and employment (x 1,000 alu) in each sub-complex in the agro-complex in the period 2003 to 2015 (indices, 2003=100)

	Added value		Employment	
	2003 (x € billion)	2015 (2003=100)	2003 (1000 alu)	2015 (2003=100)
Total agro-complex	23.7	114	396.9	87
Arable farming complex	4.7	109	75.7	85
Outdoor horticulture complex	2.3	121	41.8	97
Greenhouse horticulture complex	4.8	122	66.8	95
Pasture-based livestock farming complex	6.7	106	133.3	84
Intensive livestock farming complex	5.2	114	79.3	87

Source: CBS, processed by LEI.

However, this last percentage does give a somewhat distorted impression; 2003 was an exceptionally poor year for the intensive livestock farming sector, with low production levels (due to fowl plague and the buy-up scheme for pigs) and low yield prices. In view of the environmental policy, animal-welfare requirements and increasing competition, an increase in the added value is not expected in the period until 2015, in particular in the primary intensive livestock farming sector. The added value achieved by the poultry sector, in particular, will exhibit a further decline. The growth in the intensive livestock farming complex will probably be largely due to the additional added value achieved by the slaughterhouses and the meat-processing industries, which have devoted more attention to further processing in recent years. Meat prices could increase by 30% in the period between 2003 and 2015 if the latest price movements (CBS, price indices) continue into the future. This price effect will compensate the decline in volume, and will result in a slightly greater added value for the overall complex. It should be noted that this will be accompanied by a 13% decline in employment, whereby the feed industry will also be severely affected. In the reference scenario, the added value of the horticultural complexes will increase more than in the other sub-complexes; employment will decline in all sub-complexes, although least in the horticultural complex (Table 4.2).

In comparison with the other complexes, much more of the (nominal) growth in the added value of the horticultural complexes will be due to the increased production of the primary farms. For example, the production of vegetables and ornamental plants is expected to increase by some 12% in the period between 2003 and 2015.
As was the case in the past decade, in the coming years the growth in the pasture-based livestock farming complex will continue to lag behind the growth of the total agro-complex – and in spite of the slight increase in the milk quota as provided for pursuant to the Luxembourg Agreement. Within the complex, the share of the primary production segment will also decrease. This will largely be due to the lower milk prices (as a result of the lower intervention prices). The dairy industry will place a further emphasis on products with an additional added value, and consequently it is reasonable to assume that the price of dairy products will increase (by an average of 20% until 2015, on the basis of historic trends). This is in part the reason why the pasture-based livestock farming sector will still be the most important sub-complex in 2015 (table 4.3), although the sector's lead will diminish. Pursuant to the current trend, employment in the pasture-based livestock farming complex will continue to decline.
Table 4.4 summarises the situation for the overall agricultural complex. The figures reveal that the primary sector's share in the total added value will remain unchanged at the present level of 35%. In the past, this share had exhibited a continual decline. This break in the trend is due to the growth of the horticultural sector, in which the majority of the products supplied by the primary producers are finished products in need of little further processing. The agro-complex retains its great dependency on exports. Part II contains a more detailed discussion of the forecast economic significance of the sub-complexes in 2015.

4.2.2 Agricultural and horticultural holdings

The number of agricultural and horticultural holdings will continue to decline during the coming years as a result of a variety of factors, namely increasing productivity, the generally restricted opportunities for further growth in sales, succession problems, and pressures to achieve increases in scale (table 4.5). With an average decline of 3% per annum, the number of farms will fall to below 60,000 by 2015, more than 30% lower than the almost 84,000 farms in 2004. Substantial decreases are expected in sectors such as mushroom, dairy and pig farming. However, the continuing increases in scale will also result in a decline in the number of farms in segments in which production is expected to grow, such as the greenhouse and outdoor ornamental plant sectors.

4.3 Sub-complexes

This section reviews the prospects for each sub-complex, including a brief discussion of the (future) relationships in the chain of supply, processing and marketing, and in the primary farm structure of the relevant sub-complex. More detailed information is included in part II of this report.

Table 4.3

The sub-complexes' shares in the added value of and employment provided by the total agro-complex in 2003 and 2015 (in %)

	Added value		Employment	
	2003	2015	2003	2015
Arable farming complex	19.6	18.9	19.1	18.3
Outdoor horticulture complex	9.8	10.4	10.5	11.6
Greenhouse horticulture complex	20.2	21.7	16.8	18.2
Pasture-based livestock farming complex	28.3	26.5	33.6	31.8
Intensive livestock farming complex	22.1	22.1	20.0	19.7
Total agro-complex	100	100	100	100

Source: CBS, processed by LEI.

Table 4.4

Added value of and employment offered by the various parts of the national agro-complex in 2003 and 2015

	Added value (x € billion)				Employment (alu)			
	2003	%	2015	%	2003	%	2015	%
Agriculture and horticulture	8,179	35	9,390	35	167,979	42	141,362	40
Processing	4,800	20	6,315	23	50,845	13	42,248	12
Delivery	7,594	32	8,021	30	123,046	31	114,283	33
Distribution	3,035	13	3,195	12	55,610	14	52,270	15
National agro-complex	23.608	100	26.921	100	397.480	100	350.163	100
In % of national total	5.9		4.2		6.2		5.4	
Export dependency (%)	74.6		74.1		74.9		74.3	

Source: CBS, processed by LEI.

4.3.1 Arable farming complex

The prospects for arable farming are not promising. Amendments to the EU sugar policy are imposing pressure on sugar beet cultivation, and alternatives such as unregulated or energy crops offer few opportunities for a supplementary income. Moreover, increases in scale are impeded by the relatively high land prices. However, growing foreign markets do offer opportunities for seed potatoes.

General

The chain's quality management is focused primarily on fresh produce, such as table potatoes, although the control measures also extend to processing companies. The increasingly stringent requirements imposed by international retail and processing companies give cause to the need for further professionalisation and increases in scale of the primary arable farms. In some situations, collaboration between growers could offer an alternative, in particular for products that are either supplied fresh to consumers or undergo little post-harvest processing (such as potatoes, onions, and vegetables). However, associations of this nature will usually offer insufficient scope for export products. The saturated markets and low prices for produce such as table potatoes and onions do not encourage further expansion. The production of the potato-processing industry would appear to be stabilising at about three million tonnes. The increasing awareness of obesity and changing consumption patterns give cause to the expectation that demand for pre-fried potatoes will decrease rather than increase. The acreage of starch potatoes under cultivation has decreased to about 50,000 hectares, although the (quota) production remains constant. Amendments to the sugar policy will result in substantially lower prices for and income from sugar beet. Some growers will discontinue the cultivation of sugar beet, and will complete their crop plans with cereals.
Depending on European and global market prices, the acreages of unregulated crops may exhibit a fluctuation in the short term. However, major shifts are not expected, in part in view of the specific investments in buildings and mechanisation. The need for high-quality plant material, in particular from Middle and Eastern Europe, will probably exert a beneficial effect on the demand for seed potatoes. China could also be an interesting market.

Farms

The number of arable farms decreased by an average of 1.2% per annum during the period between 1980 and 2004. However, the rate of the decline accelerated during this period. On the basis of this trend an average 1.6% decrease per annum is forecast for the coming period, resulting in a total of somewhat more than 10,000 farms in 2015. The actual decline during this period will depend largely on the continuation of the smaller farms. More than half of all arable farms are small farms: smaller than 40 DSU (Dutch size unit (DSU); equivalent to 45.8 ESU). The average size of the farms will continue to increase.

Table 4.5

Numbers of agricultural and horticultural farms in each segment, 1990-2015

	1990	2000	2004	2015	Mutation (% per annum)	
					1990-2004	2004-2015
Total, agriculture and horticulture	124,900	97,480	83,890	59,170	-2.8	-3.1
Arable farms	16,260	13,750	12,630	10,540	-1.8	-1.6
Greenhouse horticultural holdings	10,240	7,910	6,390	4,240	-3.3	-3.7
Mushroom holdings	790	410	350	130	-6.7	-7.1
Outdoor horticultural holdings [a)]	9,990	7,820	6,680	5,020	-2.8	-2.6
Dairy farms	39,550	26,820	22,280	13,820	-4.0	-4.2
Other grazing livestock farms	17,500	18,970	18,830	15,150	0.5	-2.0
Pig farms	9,200	6,060	4,180	2,380	-5.5	-5.0
Poultry farms	2,140	1,830	1,360	880	-3.2	-3.9
Veal farms	1,250	1,280	1,160	1,100	-0.5	-0.5
Combined farms	14,790	9,850	7,770	4,690	-4.5	-4.5
Other farms	900	1,730	1,660	1,220	4.5	-2.7

a) Specialised vegetable, fruit, bulb and tree nursery holdings.
Source: CBS, processed by LEI.

The average crop plan has become more intensive in the past few years: The acreage of regulated crops declined, whilst that for a number of unregulated crops (such as seed and table potatoes, and seed onions) increased. However, this development would appear to be coming to a halt; further intensification is becoming increasingly difficult due to reasons such as phytosanitary requirements and the availability of suitable land. High land prices (and the financial position of farms) are increasingly resulting in farmers' preference for intensive cultivation involving the exchange or rental of land rather than the purchase of land. Since other agricultural sectors can be involved in these exchanges of land (such as dairy farming and bulb cultivation) arable-farming areas will develop a more variegated form of agriculture. From a phytosanitary perspective, preference is given to closed farms for the cultivation of high-quality plant material such as seed potatoes.

4.3.2 Outdoor horticulture complex

The expected increase in global prosperity (for example, in Eastern Europe and China) offers favourable prospects for the cultivation of ornamental products such as bulbs and tree-nursery products. However, the prospects

for the outdoor cultivation of vegetables and fruit are less favourable; increasing competition is being encountered from foreign growers with lower cultivation costs. Innovations are acting as an incentive to increases in scale, whereby spatial-planning policy determines the feasibility of expansion.

General

Most of the produce from this heterogeneous complex (vegetables, fruit, bulbs, trees) is supplied to the wholesale channels and the ultimate consumers without any processing. Consequently, changes in the processing industry have little direct effect on this complex. Increasing competition from Eastern Europe could result in a decline in the Dutch cultivation of some outdoor vegetables.

Most produce is sold in a less 'stringently' organised manner than in the majority of the other complexes (i.e. not via processing companies and supermarkets). This offers relatively more opportunities to growers to join forces in sales to local/regional markets (in particular, vegetables and fruit) or to foreign customers (in particular, ornamental crops). In combination with the growers' concerted marketing, the increasing diversity in demand can create opportunities for products such as regional crops or pre-processed vegetables. This diversity can to some extent slow the response to the predominant importance of increases in scale.

Bulbs and trees are (still) sold largely via channels other than the supermarkets. For this reason, the major chains are able to exert much less control on these products than on vegetables and fruits. Garden centres could, in principle, exert this control; however, at present they lack the necessary organisation (few large chains).

The prospects for tree nursery and bulb cultivation, in particular, give cause to the forecast of a nominal growth of this complex in excess of 20% (table 4.2). Employment is expected to remain virtually unchanged. The complex' share in the total agricultural sector will gradually increase to more than 10% of the added value and more than 11% of the employment (table 4.3). Since virtually no processing is carried out by this complex, the operations are focused on the primary production. The sectors in this complex are highly dependent on exports; this dependency will increase further to almost 90% in 2015.

Holdings

The number of outdoor-horticultural holdings will decline by 2 to 3% per annum during the coming period. The current trend towards increases in scale in the *outdoor vegetable cultivation sector* will continue at a rapid pace. This expectation is based both on the moderate competitive strength of the Dutch outdoor vegetable cultivation sector and the poor financial position of many farms. In addition to these Dutch increases in scale, it is also expected that many farms will open a foreign branch – a development that will not be intended solely to reduce cost prices, but will also enable the

primary sector to deliver produce to its direct customers throughout the year. The increases in scale will also continue in the Dutch *fruit cultivation sector*. This will in turn result in a one-third reduction of the number of specialised fruit farms during the period between 2004 and 2015. The extent to which what are referred to as the 'apple club varieties' (see section 6.3.2) will succeed in the market is still uncertain. The success of these varieties could be beneficial to the long-term development of the sector's income. An issue of importance to pear cultivation is the extent to which the Conference variety will be successful in markets other than those that have been supplied to date. The sector could receive a significant impetus in the event that it proves possible to provide constant supplies to the German market (in contrast to the current 'stop-gap' supplies).
For the Dutch *bulb cultivation sector*, only a modest growth in market demand is forecast in the period to 2015; the growth will, in any case, be somewhat slower than in the past 25 years. It is expected that the number of specialised bulb-cultivation farms will continue to decline, albeit at a slower rate than in the past few years.
The increase in the production of the *tree nursery sector* is in excess of the growth of the acreage: consumer crops that achieve a relatively high production value per hectare will account for the majority of the increase. This expansion in the production will be focused in specific regions in which land is not scarce and where the spatial planning policy offers scope for arboriculture. These regions are primarily located in the south-east of the Netherlands. The number of specialised tree nursery holdings is expected to decline at a slightly more rapid rate than in the past few years.

4.3.3 Greenhouse horticulture complex

The demand for high-quality vegetables and ornamental produce will grow with increasing prosperity. The prospects for these greenhouse crops are favourable, provided that care is devoted to more intensive collaboration in the chain. Technological innovations can contribute to more sustainable production methods, and greenports offer scope for structural development. However, the situation is very different for the mushroom sector, a sector that is confronted with additional competition from Eastern Europe and China.

General

The auctions (particularly those of the Dutch Flower Auctions Association) and the trading and export companies active at those auctions play an important directive role for *flowers and pot plants*. Moreover, the Netherlands benefits from its position as the market leader in the breeding, selection and propagation of the necessary plant material. Although some of this work is being transferred low-wage countries (particularly labour-intensive work), the sector nevertheless retains its ability to introduce new crops in response to developments in demand. Large lots of homogeneous products (such as pot plants) can be supplied to customers via the auctions, and the trading companies can then offer mixed bouquets of flowers to retailers.

Supermarkets are expected to play a more important role in sales of ornamental products and, consequently, play a more determinative role in specifying quality requirements. Seals of approval and quality marks such as MPS emphasise the sector's leading position.
Exports of *greenhouse vegetables* (in particular, fruit vegetables such as tomatoes, sweet peppers and cucumbers) to neighbouring counties (Germany, the UK) remain determinative for the sector. Spain is the sector's main competitor in these markets. Supplies to these export markets need to take account of the divergent requirements of the local supermarkets (more price competition in Germany, more service in the UK). The sales organisations (such as The Greenery) will need to accommodate these different requirements. The increases in scale of the demand also require (more) concentration in supplies, with deliveries of lots with maximum homogeneity.

Holdings
During the past 20 years, the operations of the greenhouse horticultural sector have shifted from vegetables to cut flowers and, in particular, pot plants. During this same period, there were substantial increases in scale. Increases in scale of and/or collaboration between the primary holdings are intended to retain the sector's powerful competitive position. This development will be accompanied by a further decline in the number of companies: the number of specialised greenhouse horticultural holdings will decrease from the current 6,000 plus to 4,000 plus in 2015. The total acreage of greenhouse horticultural operations will increase slightly.

4.3.4 Pasture-based livestock farming complex
The reform of the European agricultural policy, liberalisation and environmental measures are all reducing the income of dairy farms and their opportunities for growth. Dairy farmers' choices are directed towards cost reductions (increases in scale) or diversification. The sector's prospects are greatly dependent on the manner in which the Dutch dairy industry develops its powerful international position. This will require fundamental product development and innovation.

General
The quality requirements the chains have been imposing on dairy farmers in past years have already had some effect on the structure of the farms: farms that could not – or would not – adjust to the new requirements have discontinued their operations. In the future, the dairy industry could possibly increase its control of the composition of the milk required to prepare various products.
The foot-and-mouth disease outbreak that occurred several years ago has resulted in a major change in the sales channel for cattle; the chain has been shortened following the disappearance of the majority of the cattle markets. This has enabled slaughterhouses and exporters to exert more influence on the sector, although the small scale of many farms (many

other grazing-animal farms, most cattle selected for milk production) results in an extremely varied supply (small lots, large fluctuations in quality). The prospects for the Dutch dairy sector's sales are not unequivocally favourable. The sector is confronted with increasing competition, both in Europe and elsewhere. These cooperatives are expected to engage in product development and innovations that maintain the dairy farmers' milk price at the highest possible level in the period in which European guarantee prices are falling.

Farms
Dairy farms need to reduce their costs by means such as increases in scale; however, in the Netherlands, they are confronted with high prices of land and quota. In the past few years, the number of farms has declined by some 4% per annum. In view of the age structure of the current entrepreneurs (more than half are older than 50) and the succession percentage (a little more than 50%), there is no reason to presume that this rate will slacken in the coming years. At present, the country has more than 22,000 (specialised) dairy farms, with an average of some 65 dairy cows on almost 40 hectares of land. The forecasts for 2015 indicate 14,000 farms with an average of just over 80 dairy cows on more than 50 hectares of land. Consequently, the average milk production of each farm in 2005 will amount to some 800,000 kg. The current figure is about 500,000 kg.
In the event of a trend increase in the production per cow and an essentially unchanged but slightly larger milk lake (quota of approximately 11 billion kg +1.5%), the total number of Dutch dairy cattle will decrease by about 1.7% per annum. The number of dairy cows will then decline from the almost 1.5 million of the past few years to about 1.2 million in 2015.

4.3.5 Intensive livestock farming complex
The prospects for the sectors in this complex vary from a slight decrease (of broilers) to possibly even a slight increase (veal calves). Although prices could rise to a somewhat better level in comparison with the past few years, the sector is nevertheless confronted by increasing competition – especially from overseas. In addition, environmental and spatial-planning regulations impede structural development. More intensive consultations within the chain could enable the complex to supply the fresh and processed high-quality products required to regain the market positions it has lost over the years.

General
Quality requirements (animal health, food safety and animal welfare) will increasingly determine the operations, organisation and structure of the primary farms. The primary sector will need to make large investments if it is to meet these requirements, whilst the cost price will need to remain low if the sector is to retain its competitive position. Consequently, smaller farms and smaller production units (such as mixed farms) will often be unable to keep up with these developments. Moreover, volume benefits

available within the chain (bonuses on delivery, discounts on supply) impart an additional impetus to increases in scale. Alongside the markets for its products and the processing of its products, the relationship with feed suppliers is also of great importance to the intensive livestock farming complex. The chain has long exerted a great influence on the veal sector – a sector in which integration plays a dominant role – and has succeeded in responding to opportunities offered by the markets in Italy, Germany, and France. In the past, exports largely comprised half carcasses, and fore and hind legs; exports have since been expanded to include deboned and cut products. To date, the greatest effect of the increases in scale has been the development of more homogenous products (little diversity between the breeds of pigs and poultry). A response to consumer demands for increasing diversity could offer opportunities. This has, for example, already become apparent with eggs. The restricted success of free-range and organic pork demonstrates that this is not a rapid process. Conversely, the success of free-range eggs shows that the market can change very quickly; battery eggs (that are cheaper to produce) have virtually disappeared from the consumer market within the space of just a few years.
Further processing of the product (such as poultry in portions, snacks, etc.) could give cause to a shift in consumption patterns (increased per capita consumption of chicken). Product processing tailored to specific consumer products could, self-evidently, also contribute to an increased added value per unit product.
The government's 'buy-up scheme' introduced within the scope of the country's manure policy has resulted in a major reduction in the number of animals during the past few years, in particular the number of pigs.

Farms
The number of farms with pigs and/or poultry will exhibit a further substantial decline during the coming years (see table 4.5). Should the current trend continue, then in 2005 the Netherlands will have some 2,400 specialised pig farms, 880 specialised poultry farms, and 1,100 veal farms. The increasing specialisation of farms will result in an even greater decline in the number of (mixed) farms engaged in intensive livestock operations. These developments will be accompanied by an increase in the number of animals per farm. No major shifts are expected in the regional distribution; the farms will continue to be concentrated in the south and east of the Netherlands.

4.4 Sensitivity to policy

4.4.1 Introduction

The aforementioned prospects for the Dutch agricultural sector have been reviewed on the basis of a number of assumptions relating to demand, supply, and policy. This sub-section examines the possible influence of policy on the forecasts. To what extent could alternative policy decisions influence the sector's prospects? This question is addressed by a review of two alternatives. The first alternative, the 'mild' variant, is based on the less drastic

Table 4.6

Principles for sensitivity analyses

Variant / Aspect	Reference scenario	Continued protection	Drastic reforms
Degression of payments + modulation (%)	25	10	100
Milk quotas	Maintain	Maintain	Abolish
N policy (kg N from animal manure per hectare)	170	250[a]	140
Manure disposal costs (euro per m^3)	25	25	35
Reduction of import tariffs for market regulated/ unregulated products	30/80	30/50	80/80
Tariff escalation (processed products)	Maintain	Maintain	Abolish

a) For farms with more than 70% grassland, other farms 170 kg N per hectare

reduction of import protection *and* the limited reduction of farm payments *and* the introduction of less stringent environmental requirements relating to manure. The second alternative, the 'severe' variant, is based on the further reduction of import tariffs *and* the further reduction of support *and* the introduction of more stringent environmental requirements. Table 4.6 summarises both variants. The consequences of these policy decisions are reviewed in qualitative terms in comparison with the reference scenario for each sub-complex. Some issues will be illustrated with a few figures obtained from explorations carried out using DRAM.[1]

4.4.2 Mild variant: continued protection

In the *arable farming* sector, the moderate degression of payments will have a slightly beneficial effect in comparison with the reference scenario. The benefits will be greatest for farms cultivating starch potatoes, sugar beet, and cereals. The manner in which payments are cut back will have little influence on farms growing relatively large crops of potatoes or outdoor vegetables. The relaxation of the manure limit to 250 kg N/hectare would have no direct effect on arable farming, and a limit of 170 kg N/hectare would also be little problem. The relatively lower disposal problems for the livestock farming sector would have two consequences for the arable farming sector: there would be less pressure on the use of arable land as grassland (and, consequently, reduced pressure on land prices); however,

there would also be less interest in the disposal of animal manure to arable farmers (and consequently reduced charges would be levied for the supply of animal manure to arable farmers).
The *horticultural complex* (outdoor and covered crops) is largely dependent on growth in demand, spatial planning (in particular, in urbanised areas), and innovations. Developments in the Common Agricultural Policy will play a more limited role. From an environmental perspective, crop protection and energy (rather than the manure file) are the most important issues requiring attention. In the trade policy area, a number of modalities in the WTO Agreement could have a slight effect. For example, in the mild variant the mushroom sector would not need to be so concerned about Chinese competition. Conversely, a point of concern *would* be the concomitant effect of a less drastic reduction of the tariffs; this would also imply fewer export opportunities for some crops.
The European agricultural policy, WTO, and nitrate and ammonia policies all play important roles in the *pasture-based livestock farming sector*.
A reduction in the payments limited to 10% in the period until 2015 would result in an improvement of some 10% in dairy farmers' income. A relaxation of the manure standard to 250 kg N/hectare would provide for the retention of a slightly increased number of dairy cows in the Netherlands; however, in view of the retention of the milk quota, the overall effect of this relaxation would be no more than marginal. In addition, larger numbers of beef cattle would be retained than in the reference scenario. The relaxed manure limit would reduce the need to purchase land (for expansion). This would in turn reduce the upward pressure on land prices.
The prospects for the *intensive livestock farming sector* are greatly influenced by environmental policy. The mild variant assumes a relaxation of manure limits. Consequently, the manure surplus would be reduced, and the farms' disposal costs would be lower. This would in turn result in a smaller reduction of the numbers of pigs and poultry in comparison with the (as such, already modest) decline pursuant to the reference scenario. However, as a result of the none-too-optimistic market prospects and increasing competition in (and outside) the EU, an expansion in the number of animals in the Dutch intensive livestock farming sector is nevertheless also unlikely in this variant. The prospects for the pig and poultry sector depend more on collaboration with the chain so as to introduce high-quality products on the market.
A less rapid reduction of the CAP farm payments (as assumed in this mild variant) would be beneficial to the veal farmers. This, in combination with a less stringent manure policy, could result in a 5-10% higher number of animals in this sector in comparison with the reference scenario (2% growth).

4.4.3 Severe variant: drastic reforms

This variant would result in drastic changes in the various income-expenditure ratios in the agricultural sector, and would in turn have consequences for the size, composition and method of production. In comparison with the reference scenario this variant would result in increased dynamism.

The complete abolition of the farm payments and a further cutback of border protection would be detrimental to the income of the *arable farming sector.* Farms that are greatly dependent on these farm payments – the growers of regulated crops – would see the basis of their income disappear. Their alternatives are limited; markets for any other products rapidly become saturated, whilst growers of relatively large quantities of row crops have virtually no opportunities for further intensification due to the limitations imposed by soil fertility and disease pressure. In many instances, efficiency improvements by further increases in scale will be the only solution. The regions in which the crop plans are largely comprised of regulated crops – the peat district and the Oldambt region – will release land that can be used for livestock farming.

This latter sector will then claim the arable land that becomes available in view of the more stringent manure policy pursuant to this variant. Livestock farmers would then need to dispose of more manure; this, assuming an increase in the acceptance of manure, would be beneficial to arable farmers' income. The more stringent manure limit would not have any significant direct effect on arable farming, although it is possible that there would be a slight decrease in the production per hectare in comparison with the reference scenario. However, farms in sandy regions would be an exception; the risk of nitrates leaching into groundwater is greater with sandy soils. The decline in the number of (specialised) arable farms would be greater than in the reference scenario.

An additional reduction of border protection is of interest to the *horticultural complex*. However, this severe variant assumes the same reduction of tariffs as in the reference scenario. A development that could possibly be of influence to sectors such as the vegetable and fruit sectors in this complex is the abolition of the principle of tariff escalation. Tariff escalation relates to tariffs that increase in proportion to the degree of processing of the relevant product. The abolition of tariff escalation would result in one tariff for both the unprocessed and processed product. Implementing this measure would act as incentive for the import of processed products. Various studies have revealed that tariff escalation is also an issue (alongside coffee, cocoa, and fish) for pineapples/pineapple juice, oranges/orange juice, apples/apple juice, lemons/lemon juice, grapes/grape juice and tomatoes/tomato juice product combinations (Ministry of Foreign Affairs, 2002). The abolition of tariff escalation would result in increased international competition in the market for the aforementioned (fresh and processed) products cultivated by this sub-complex.

This severe variant – including measures such as the abolition of the milk quotas – has drastic consequences for the *pasture-based livestock farming sector*. The discontinuation of the farm payments would result in a substantial decrease in the incomes in the primary sector. The more drastic reduction of the import tariffs would lower European milk prices. However, the abolition of milk quotas would enable the Dutch dairy farming sector to increase its production – and the potential for growth is substantial, possibly as

much as 40% of the current production level. In practice, growth of this level would not occur; even if there were actually a market for the additional quantity, the growth in milk production would nevertheless be curtailed by the manure limit. The 140 kg N/hectare limit in this variant would result in a larger manure surplus than in the reference scenario, and the surplus would increase even more with an expansion of the number of dairy cattle. Nevertheless, in 2015, the number of dairy cows would be more than 15% above the number pursuant to the reference scenario. The costs incurred in manure disposal would increase, whilst some of the land required for expansion would need to be obtained from the arable-farming sector. In mixed regions, the collaboration between specialised arable and dairy farms could be increased.
In the *intensive livestock farming sector*, the more stringent limit pursuant to this severe variant would greatly increase the costs of manure disposal. These increased costs would increase even more as a result of the expansion in the number of dairy cows following the abolition of the milk quotas. These additional manure-disposal charges would exert a great influence on incomes in the intensive livestock farming sector and, if manure processing were not profitable, would result in a substantial decrease in the number of animals. This variant would result in an almost 30% decrease in the number of pigs as compared to the reference scenario. Estimates indicate that the reduction in the numbers of veal calves and poultry would be of the order of 10%. In fact, the decline in the number of poultry – and, in particular, in the number of broilers – could be larger due to even more competition from outside Europe following the additional liberalisation of trade. At present, even the current import tariffs offer this sector barely adequate protection from competition from Brazil and Thailand.

4.5 Other functions

4.5.1 Diversification

Society's need for diversification is expected to increase in the coming years. Pursuant to the current government plans, the future budget for agricultural nature management could increase to € 70 million per annum. Partly in view of the probability that more EU funds will be made available for this purpose, this could result in a budget double the current level. However, a snag in the current system is the link between the payments and the price of (green) fodder. A fall in this price imposes pressure on payments.
In view of the restricted growth in the recent past the market for agri-tourism would not appear to offer any further opportunities for major growth. This is particularly applicable to recreational accommodation; however, there could possibly be more opportunities for day trips. In a recent report (2005), the *Marktplan Adviesgroep* (Market Plan Advisory Group) refers to 'some further growth.' The achievement of the growth to 1,000 care farms forecast by the *Landelijk Steunpunt Landbouw en Zorg* (National Agriculture and Care Centre) (2004) would result in a threefold

increase in the turnover of the 'agri-care' sector. This development is greatly dependent on care financing, in particular the issue as to whether the personal care budget will be retained in full.
In theory, there are ample opportunities for shelter. The supply is determined by the number of farm buildings that become available – and tens of thousands will be vacated during the coming years. However, it is uncertain whether these buildings will be suitable, how long they will be available, whether they are in the right location, and whether there is a need for them. The number of wind turbines could exhibit a further increase. Government policy is focused on a further increase in the proportion of sustainable energy in the total energy supply. However, the erection of solitary wind turbines is confronted with increasing planning resistance.
Increased opportunities for farmers' outwork will become available in the area of land management and similar; conversely, the opportunities offered at their colleague farmers will probably decrease, since larger and more specialised equipment will be required.
A possible new area of diversification is the production of energy by co-fermentation (biomass and manure). This could enable farmers to supply electricity to the public grid. A number of initiatives have already been taken in this area, and higher oil prices could act as an incentive. In some areas, there could be opportunities for the construction of water storage areas; the importance of these areas will certainly increase in view of the many new flood-control plans.
On balance, a longer-term growth of 50 to 100% in these diversification areas would not appear to be impossible. The opportunities for diversification will vary from region to region; more recreational opportunities will be available in the regions around the major cities, the coastal area and the Veluwe national park than elsewhere in the country. A similar regional variation is also applicable to agricultural nature management, where most opportunities will be available around the national ecological network.
The amendments to the agricultural policy will increase the farmers' need for new sources of income. Interest in diversification will increase with the elimination of bottlenecks and the increase in – more durable – remuneration for services, in particular collective services. In addition, interest will also increase when a larger proportion of the payments – in line with the current proposals – are devoted to rural activities.
In principle, the opportunities available for processing at primary farms increase with their size: larger farms constitute more appealing suppliers. In addition, supermarkets would appear to be exhibiting increasing interest in regional products.

4.5.2 Landscape

In spite of the restricted differences in climate and elevation in the Netherlands, it is nevertheless possible to refer to an extremely varied countryside – with very different types of (agricultural) landscapes such as polders, moorland, marsh, hills, rivers, coast, sand, and marine clay. No major changes

will occur in the landscape; agriculture, which occupies 67% of the land, will continue to dominate the Dutch landscape during the coming years. In spite of urbanisation pressure, in the years until 2015 the 'loss' of agricultural land will remain limited to less than 100,000 hectares – equivalent to less than 5% of the current area. However, significant regional differences in areas such as the vicinity of cities could result in major effects on the landscape.

In general, further increases in scale are taking place in the agricultural sector, and the number of farms declines by an average of about 3% per annum. The vacated farms and farm buildings can be used for new purposes, i.e. business premises or housing. However, this is accompanied by a risk of fragmentation of the landscape.

Expansions of farms, with larger farm buildings, (often) result in changes in the regional countryside. As such, these developments do not necessarily need to be the decisive factor in determining the appearance of the landscape – provided that the size and shape of plots pay due regard to the nature and cultural-historical elements, vegetation, and open qualities of the surroundings. Increases in scale in originally small-scale and varied landscapes can readily result in monotony on the disappearance of field boundaries and the associated elements of the landscape such as hedges, wooded banks, and watercourses. Moreover, larger farm buildings can often clash with their surroundings.

Agricultural business parks, such as the concentrated relocation of intensive livestock farms or greenhouses, can also exert a major influence on the landscape. Greenhouses, in particular, can have a great effect on the landscape. This is an issue in need of a restrictive policy and measures to ensure for their appropriate assimilation in the landscape.

The public's wish to seek peace and recreation in the countryside gives cause to the need for more cycle and rambling tracks alongside and over farmland. A range of regulations and budgets offer excellent opportunities for the creation of these facilities (for example, the rural development plan (POP) funds). This latter is particularly applicable to areas with attractive landscapes, and to agricultural regions around the major cities. These areas are also most suited to agricultural diversification.

An agricultural sector with a broader social role will need to enter into more extensive consultations with its surroundings (the public, organisations, and authorities) about the management and development of the land, etc.; the agricultural use of the land will no longer be of primary importance. Moreover, it will no longer be possible for the national government to supply all the necessary budgets. At a regional level, more funding will be required from the lower authorities and the market parties.

Nature and landscape management and/or recreation will, in particular, often make a major contribution to farmers' incomes in areas with agricultural handicaps and/or an appealing landscape. This combination of limited agricultural prospects and an appealing landscape is often assigned a special status (for example, as a National Landscape).

Those areas in which farms supply products to the market will exhibit only minor shifts in the use of agricultural land in the period until 2015. Grassland will continue to dominate many areas. However – and alongside the absolute reduction in their number – fewer cattle will be seen in the pastures due to the use of mechanical grazing and limited grazing. Nevertheless, young cattle are allowed to graze, and the number of horses increases. In contrast to the forecast decline in arable farming (sugar beet, starch potatoes), the horticultural sector will increase in size (in particular, ornamental plants including trees and bulbs).

4.6 In conclusion

Although the Dutch agricultural sector is in a favourable position for the future it is, nevertheless, confronted with greatly changing circumstances. These are primarily due to the globalisation of the economy, the reform of the European agricultural policy, the restricted physical and environmental scope, and technological developments.

In its markets, the sector will be confronted with increasing competition, whereby the primary sector in particular will suffer from high land and labour prices. These cost disadvantages will need to be compensated by increased productivity and an improved positioning (quality) on the market.

The prospects for the various sub-complexes differ. Although the ornamental plant sector can look forward to growth, both inside and outside the greenhouses, other sub-complexes will be confronted either with limited growth or with a decline in their production. However, the (added) value of these sub-complexes can be increased by focusing their production on products that are tailored more closely to demand.

The various links in the chain (supply, processing, wholesale, retail) continue to exhibit increases in scale. Although the primary farms lag far behind in scale, in many sectors agricultural cooperatives greatly increase the link's influence.

Companies in the various links are increasingly expanding their international operations, and may also relocate their operations abroad. This could constitute a threat to the Dutch production sector. However, examples are also known of chains that bring production to the Netherlands. On balance, these developments indicate that factors deciding the location of the agro-industry are also of importance to the primary agricultural sector.

No single link dominates the chain and is able to exert absolute power. Nevertheless, the position of the primary producer is increasingly being influenced by the conditions imposed by other links, in particular major food companies and supermarket chains.

The increasing diversity in needs offer opportunities for new business and in the fields of exclusive products, pre-processed products, sales 'outside the door,' regional products, etc. The Netherlands is still lagging behind in some of these fields.

Improvements in logistics and transport are of great importance to the competitive strength and sustainability of the chains and, consequently,

will also have an influence on the primary agricultural sector. These could impart a major impetus to the formation of concentrations of farms (agribusiness parks).
Shifts in the use of agricultural land will continue. For example, the relocation of dairy farms to the arable farmlands in the north of the country will become more pronounced. Arable-farming areas will become more 'mixed'; the same may also occur in some livestock areas, provided that the types of soil are suitable.
The number of farms will decline in all sectors, with the greatest decline in the pig and poultry sectors. However, it is expected that after the decline in previous years, the total numbers of pigs and poultry will exhibit no more than a small decrease.
Although the economic significance of the agricultural sector will remain large, it will nevertheless decrease in relative terms. Those sections of the agro-complex that are particularly focused on processing and sales will become more dependent on foreign raw materials. In addition to the provision of (safe) food and ornamental products, the sector will also play an increasingly important role as a supplier of 'green' and 'blue' services, energy, and various forms of care and recreation. Although the potential demand for diversification would appear to be large in the densely populated Netherlands, its significance for farm incomes will remain relatively limited.

Footnotes

1 DRAM ('Dutch Regionalised Agricultural Model') is a regionalised model of the Dutch agricultural sector focused on the production of agricultural products within specific technical, economic, spatial planning and policy constraints. DRAM can be used to calculate the effects of policy variants.

Part 2 Sectors

COLLABO-RATING HOLDINGS REINFORCE THEIR EFFI-CIENCY

Chapter 5

Arable farming complex

5.1 Current position

5.1.1 General

The arable farming complex is comprised of arable farming, cereal and potato processing, the sugar industry, the margarine, starch and other food industries, and the companies supplying the above. This last category includes contractor companies, the fertiliser industry, pesticide manufacturers, transport companies, and providers of business services. In addition, the operations of distribution companies involved in the export of processed and unprocessed arable-farming products are also regarded as part of the arable farming complex.

The Netherlands is by far the largest European exporter of (seed and table) potatoes and potato products. In addition, the Netherlands also imports substantial quantities of potatoes, in particular as the raw material for potato products (Figure 5.1). In recent years, the sector has lost EU market share to countries such France, Germany and Belgium, where potato cultivation has grown at a much faster rate than in the Netherlands. The Dutch sector has fewer opportunities for expansion.

The added value of the arable farming complex increased from € 3.4 billion in 1995 to € 4.7 billion in 2003. The primary-production results vary greatly from year to year, in particular as a result of the fluctuations in the production and price of potatoes, sugar and cereals, which account for 45%, 14% and 12% respectively of the arable farming production value. For example, 2003 was a relatively favourable year. When compared to the horticultural complexes, the contribution made by the primary arable farming sector is relatively low, and the contribution of the processing sectors relatively high. The absolute growth in the added value of both the supply and processing industries was in excess of 5% per annum during the period between 1995 and 2003. The arable farming complex' share in the income of the overall agricultural complex amounted to almost 20% in 2003. About 70% of the arable farming complex' revenue relates to exports, a figure lower than for the entire agricultural complex. The complex offers employment to 75,700 employees, 19% of the employment in the entire agricultural complex. The share of the sectors within the complex remained essentially unchanged during the years between 1995 and 2003 (Figure 5.2).

5.1.2 Processing

The Dutch arable farming complex is in a reasonably strong position, in particular by virtue of the processing industries – especially the potato and

Highlights

Current position

Trading houses (breeding) and processing industry (potatoes, sugar beet, cereals) contribute to leading position

Potato products constitute the most important export product

Acreage approx. 800,000 hectares (including silage maize)

Sector dominant in SW clay area, Flevoland, along the Wadden Sea, and in Oldambt and the peat district

Approx. 12,000 specialised farms

Intensive crop plan, with a large proportion of row crops: table, seed and starch potatoes and sugar beet

Fluctuating incomes as a result of unregulated products

Driving forces

Expansion of EU offers opportunities for sales of seed potatoes; increasing competition with vegetables

Amendments to the EU sugar policy impose pressure on sugar-beet cultivation

Phytosanitary quality of great importance

In general, the consequences of the Manure Act are not unfavourable; the utilisation of animal manure can contribute to the reduction of costs

Problems with the authorisation of pesticides for small crops

No urbanisation pressure in arable-farming areas; however, pressure is felt in dispersed arable-farming areas (Brabant, North Holland, South Holland, Limburg)

ICT contributes to quality improvements, production increases, cost savings (automation)

Prospects

Declining employment; substantial decrease in number of farms

More intensive collaboration in the chain (harvest chains)

Acreage of sugar beet and starch potatoes is declining

Opportunities for growth in sales of seed potatoes

Energy crops not yet profitable: residual products more interesting

Reduction of costs by increases in scale in arable farming areas

Collaboration with other arable or livestock farmers remains an option for the retention of current income levels

Other options: supplementary operations (nature, recreation, wind energy, farm stores, care) or job away from the farm

sugar-beet processing industries – and the trading houses for seed potatoes, etc.
The Netherlands occupies a leading position in the EU in the processing of both table and starch potatoes. Aviko, the first Dutch industrial potato processor that was incorporated in 1961, has since grown into the largest chips producer in the Netherlands and one of the largest in the world. The other major chip producers are McCain, Farm Frites and Lamb-Weston/ Meijer. The success of the Dutch potato industry is based on the large quantities of high-quality potatoes available throughout the year; it should be noted that many of these are imported. Developments in the markets have also been favourable, such as the growth of fast-food restaurants and the demand for convenience foods.
In view of the size of the European production quotas, the Dutch starch-potato industry (i.e. AVEBE) is also the largest in the EU. The long-term supply of raw materials in the Netherlands (and other countries) is uncertain due to agro-ecological circumstances and the CAP reforms. The industry's great dependency on EU agricultural policy is the main reason for its vulnerable position. Moreover, the industry is confronted with fierce competition from other cheaper sources of starch, such as cereals and tapioca. AVEBE has invested in high-quality production (starch derivatives) and facilities abroad designed to ensure continued supplies of raw material.
Two companies, CSM and Cosun, process all Dutch sugar beet. The sugar industry is also highly concentrated in the other EU member states, and in ten member states the entire production quota is in the hands of one or two concerns. There is virtually no mutual competition between European sugar-beet processors in sourcing their raw materials, a situation that is due to the introduction of national production quotas within the scope of the sugar policy and the mutual independency of beet growers and sugar manufacturers. Competition is also limited in the sugar markets. Nevertheless, the sugar-producing industry is under pressure. We have the impression that the Dutch sugar producers are lagging behind a number of long-standing major multinational sugar producers that have powerful positions in the EU market.
The Netherlands processes 4.5 million tonnes of cereals, far in excess of the Dutch production of about 1.5 million tonnes. Much of this cereal is imported through the Port of Rotterdam. About 1.7 million tonnes of wheat are processed into flour and meal. Most milling wheat is imported from France, Germany, and the United Kingdom. The starch industry processes approximately the same quantity of cereal as the milling industry. Wheat processed by the starch industry is sourced from the Netherlands and particularly from France and Germany. The starch is used both in food products and in non-food products (paper, textiles). A large proportion of these products are re-exported. Barley can be used as a raw material for beer. The Dutch malting plants process about 1 million tonnes of malting barley. This barley is sourced from the Netherlands (about 20%), and from Germany, Denmark, and the United Kingdom. The animal-feed industry also uses large quantities of cereal.

Figure 5.1

Dutch imports and exports of a number of arable products with the EU 25 and with other countries, average value of the years 2003 and 2004.
Source: Statistics Netherlands (CBS), processed by LEI.

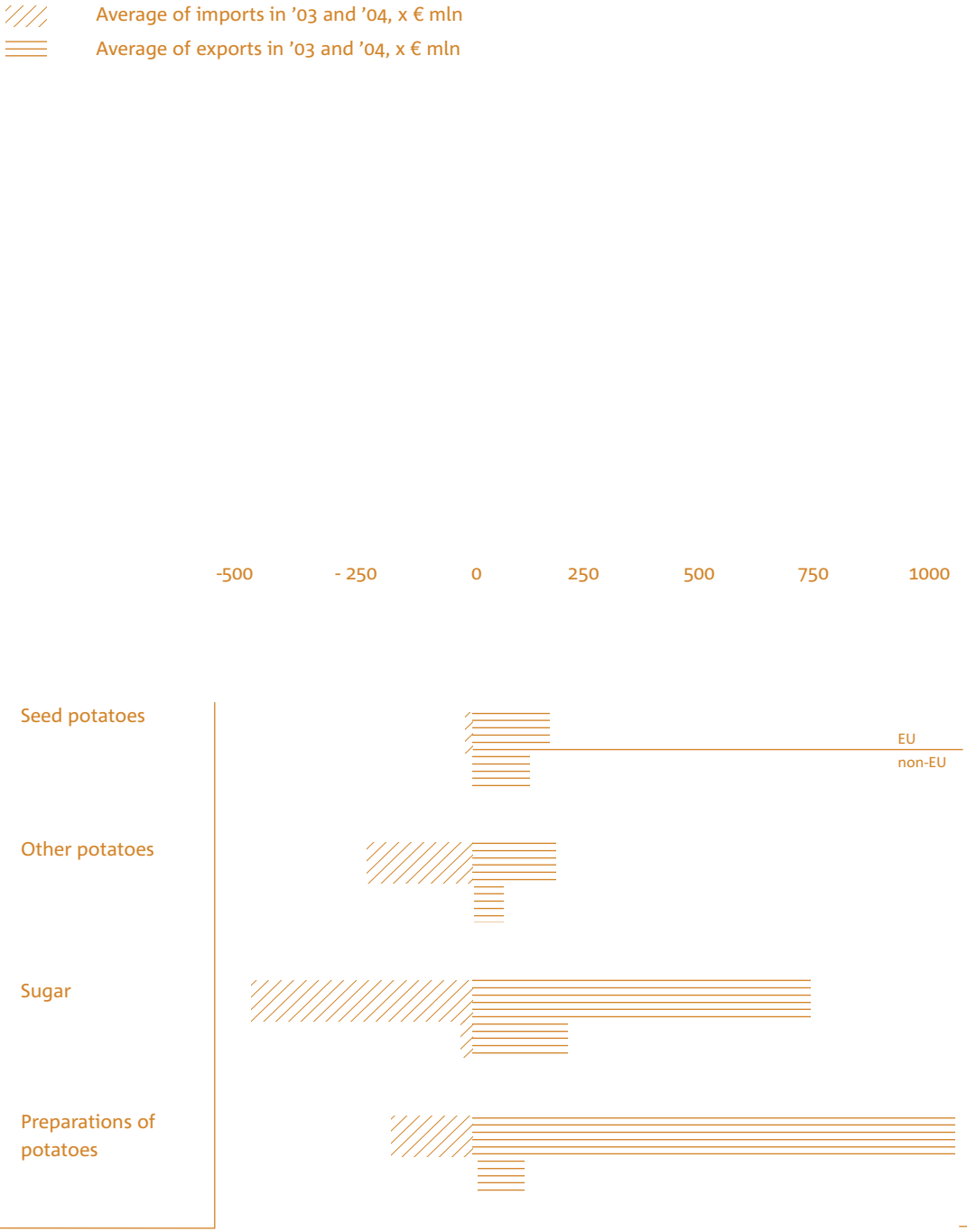
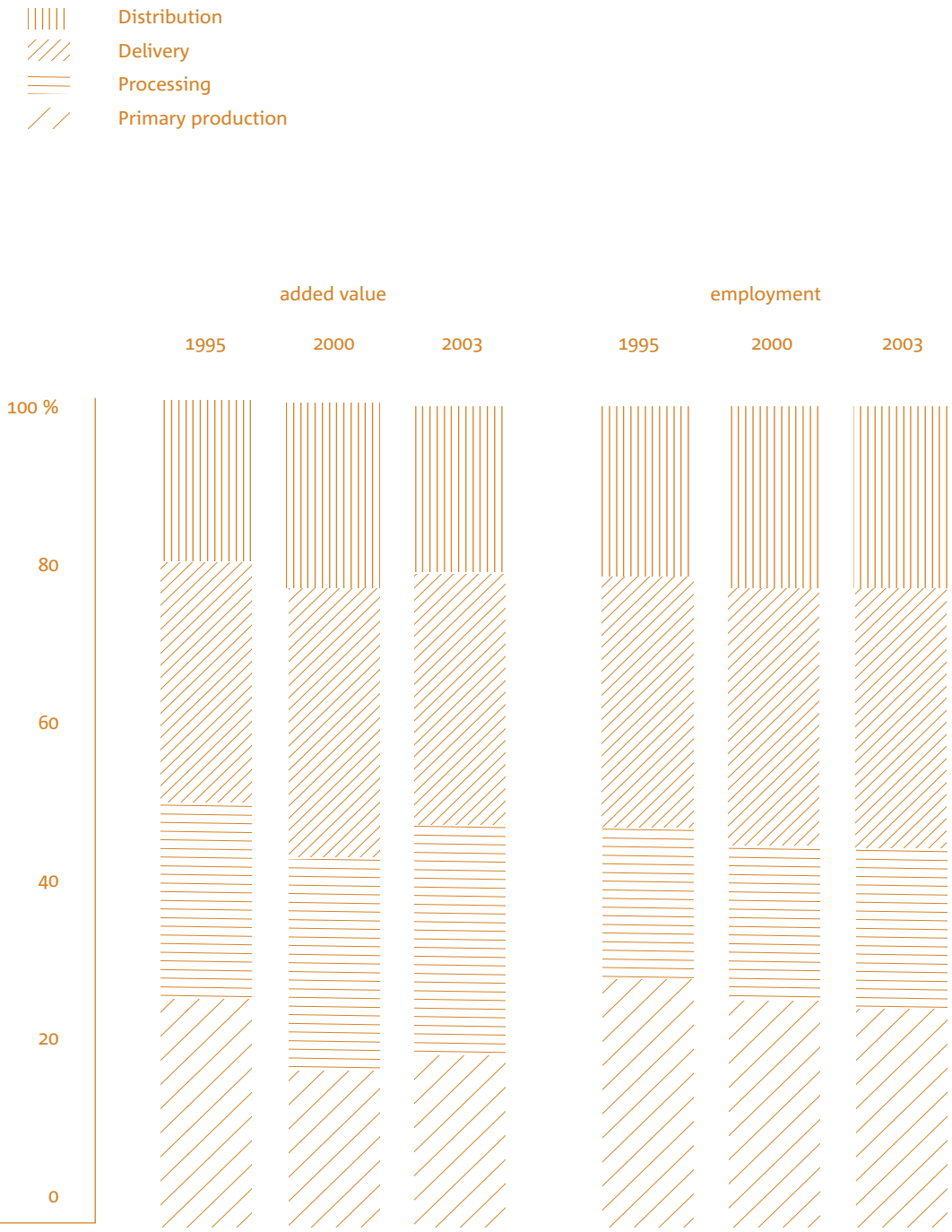


Figure 5.2

Breakdown (in %) of the added value and employment by sector in the total arable farming complex, 1995 to 2003. Source: LEI.



5.1.3 Primary sector

The total area of arable crops has remained fairly stable during the past 25 years (Figure 5.3). However, the acreage of regulated crops declined, whilst that for a number of unregulated crops (such as seed and ware potatoes, and seed onions) has increased. During this same period the number of farms cultivating arable crops has declined from approx. 50,000 to fewer than 30,000.

With its high proportion of root crops the Dutch crop plan is unique in the EU; in other member states, cereals are usually predominant. Instead of implementing increases in scale based on a larger number of hectares – a particularly appealing option in those countries in which land is less scarce and, consequently, cheaper – the Dutch arable farming sector has opted for the maximisation of the added value per hectare, for example by the cultivation of vegetables. Dutch arable farms account for a large proportion (37%) of the country's total acreage of outdoor vegetables.
In 2004 almost 29,000 farms cultivated arable crops. The number of specialised arable farms, somewhat more than 12,500, was considerably lower. These farms cultivate 71% of the total arable farmland (Table 5.1).
During the period between 1980 and 2004, the number of specialised arable farms declined by one quarter, equivalent to an average of 1.2% per annum. The number of arable farms originally increased in response to the emergence of the cultivation of silage maize and the switch of the cultivation of pulses, etc., from the horticultural sector to the arable sector. The rate of decline of the number of arable farms accelerated during the aforementioned period, and has been in excess of 2% per annum since 2000.
Table 5.2 reveals that the proportion of other crops (such as vegetables and bulbs) in the arable-farming crop plan has increased during recent decades, and that the proportion of quota products, starch potatoes and sugar beet, has decreased.
More than half of all specialised Dutch arable farms are small farms (smaller than 40 DSU, see table 5.3). Many of these farms are located outside the arable-farming regions, where the specialised farms are predominant.
The increase in the scale of Dutch arable farming is developing at a slower rate than in the other sectors, and more slowly than in the countries neighbouring the Netherlands. In 1980, farms of more than 80 hectares accounted for 13% of all arable farmland; in 2003, the percentage had increased to 28%.
The average income of Dutch arable farming families is relatively low in many years. However, those years in which the production circumstances are poor and crops are low constitute favourable exceptions to this rule. This was, for example, the case in 1998 and 2001 (excessive rainfall) and in 2003 (drought). In these years, average prices, in particular of potatoes and onions, were high. In analogy with all agricultural and horticultural farms (see section 2.3), the arable sector also exhibits substantial differences in incomes between the farms (figure 5.4).

Table 5.1

Share (%) of the acreage of arable crops on specialised arable farms, 1980-2004

	1980	1990	2000	2004
Arable crops, including:	80	80	71	71
Winter wheat	87	85	77	76
Spring barley	70	77	67	71
Seed potatoes	81	82	81	83
Ware potatoes	76	75	68	69
Starch potatoes	82	82	76	81
Sugar beet	77	77	71	71
Seed onions	-	86	84	83

Source: CBS, processed by LEI.

Table 5.2

Average shares of crops in crop plans (%) at arable farms, 1980 – 2004

	1980	1990	2000	2004
Winter wheat	23	23	21	20
Spring barley	7	5	7	8
Seed potatoes	6	6	7	7
Ware potatoes	12	13	15	12
Starch potatoes	13	11	9	9
Sugar beet	21	21	19	17
Seed onions	0	2	2	3
Other crops	18	20	20	24
Total	100	100	100	100

Source: CBS, processed by LEI.

Table 5.3

Number of specialised arable farms by farm size (in DSU[a]), 1980-2004

Size category	1980	1990	2000	2004
3 – 16 DSU	4,694	5,083	4,441	4,361
16 – 40 DSU	4,676	3,484	2,810	2,746
40 – 100 DSU	6,262	5,986	4,141	3,542
100 – 200 DSU	977	1,499	1,882	1,563
> 200 DSU	116	206	475	422
Total	16,387	16,265	13,749	12,627

a) Dutch Size Units; 1 DSU = 1.15 ESU
Source: CBS *landbouwtelling* (agricultural census).

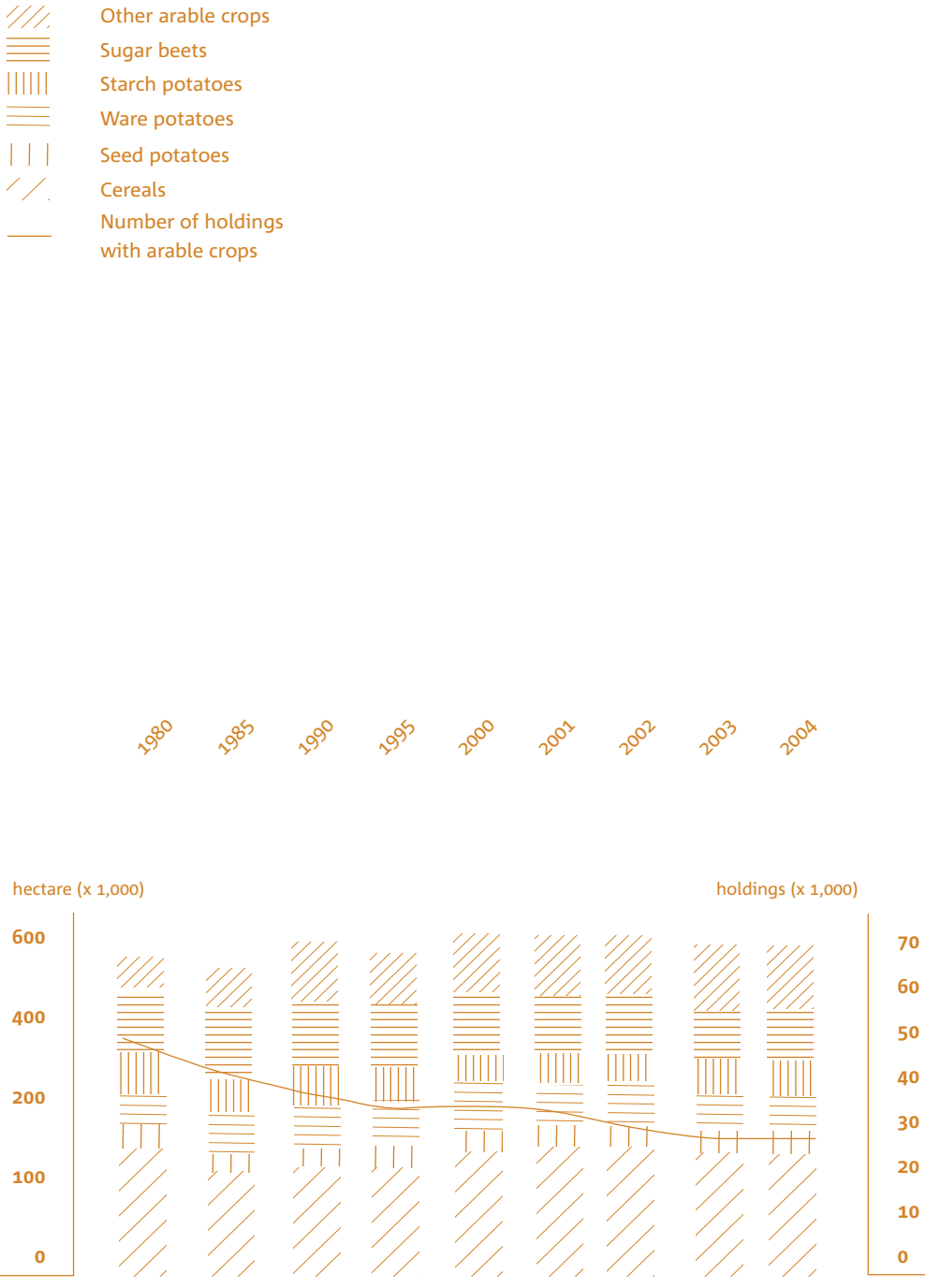
5.2 Driving forces

5.2.1 Market, CAP and WTO

The increasing attention given to a healthy diet can have an influence on dietary patterns, i.e. less fat and sugar, and fewer potatoes and chips. The food chain is responding to these potential developments.
For the time being, the expansion of the EU will not have major consequences for arable farming, in comparison with other developments (Smit, 2003; Smit et al., 2004). The Dutch lead in plant material (in particular, potatoes and sugar beet) offers the sector opportunities in the expanded EU. The Eastern European countries will wish to catch up, an endeavour for which appropriate plant material (especially seed potatoes) is indispensable. China could also be an interesting market. This may result in an increase in the Dutch acreage devoted to the cultivation of seed potatoes. Countries such as Poland will have an evident advantage in the cultivation of bulk products (such as onions, cabbage and carrots) due to their lower cost prices (labour and land costs). The Dutch arable farming sector will be unable to compete with these prices.

Figure 5.3

Area of arable crops and number of farms, 1980-2004
Source: Statistics Netherlands (CBS), processed by LEI.



The phytosanitary quality of arable produce is of great importance to the international markets, in particular for seed potatoes. Additional cost-increasing efforts are required for the inspection of products for compliance with the phytosanitary requirements; the responsibility for these inspections is borne by the producers required to furnish the necessary guarantees.

Consequences of farm payments are limited
Subsidies currently account for a lower proportion of Dutch arable farms' income than in many other EU member states (De Bont and Van Berkum, 2004). Consequently, the effects of the CAP amendments on the organisation of Dutch arable farms will probably be limited. The income of the average arable farm with relatively few regulated crops will exhibit virtually no decline on the introduction of the CAP reforms (other than the amendment of the sugar policy). However, the effect will be more marked on starch potato and cereal farms (Smit et al., 2004).

Sugar reform poses a threat
The amendment of the existing sugar policy – deemed to be necessary to bring the regulation of sugar into line with other regulated crops, and to comply with international agreements (EBA, WTO) – may have major consequences for sugar-beet farmers. The influence of these amendments will be particularly noticeable in the peat district. A price reduction of more than € 18 per tonne of sugar beet will be sufficient to cause a decline in income of 10% or more. The larger sugar-beet growers and arable farmers in the peat district will also experience the largest relative decline in income. A deterioration of the sugar market conditions such that the price of sugar beet falls by some € 30 per tonne (approx. 60%) to the critical level of just above € 20 per tonne will place the continuity of Dutch sugar beet cultivation at risk. The cultivation of sugar beet would then be even less appealing than the cultivation of cereals. It should be noted that the Commission has proposed a 42% price reduction together with partial income compensation. The extent to which the Council will adopt the Commission's proposals is not yet known.

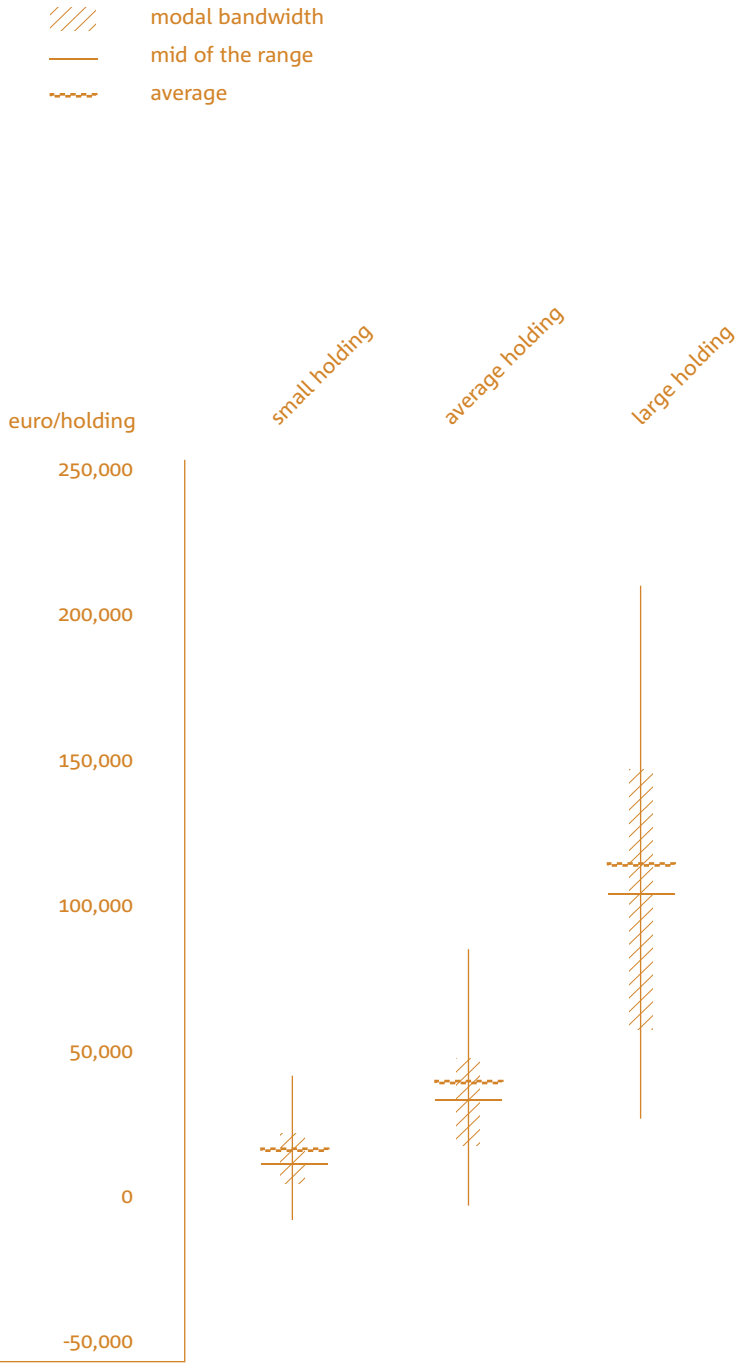
Uncertainty
The price reforms may cause an increased fluctuation in the price of products. In addition, the possible replacement of the current system of payment entitlements by a flat rate system will be accompanied by a great deal of uncertainty for arable farmers (income) and for the other links in the chain (size of the crops).

5.2.2 Environment

Pesticides
The harmonisation of European pesticide policy will continue during the coming period. It is expected that the European standards will become more stringent; however, the Netherlands already has a stringent policy for the

Figure 5.4

Differences in family income from arable farms by size category, average 2001-2003
Source: LEI.



agricultural use of pesticides. Consequently, this issue will have little influence on the country's arable farms. Nevertheless, small crops are an issue requiring attention in the Netherlands; difficulties are being encountered with the authorisation of pesticides for small crops (on a European scale), and this can impede the cultivation of these crops.

Minerals policy

The Netherlands' minerals policy is based on the European Nitrates Directive. The land of farms wishing to be considered for derogation (an increase in the limit for nitrogen from animal manure) will need to be comprised of at least 70% grassland. Consequently, in the future these (livestock) farms will cultivate less silage maize or other crops, such as potatoes. This will to some extent alleviate the pressure on the market for products such as ware potatoes. The standards for nitrogen use imposed on arable farms will be more stringent than the current standards. In principle, N fertilisation shall need to take place in accordance with the application recommendations. A lower application of manure will be required for sandy and loess-type soils that do not comply with the 50mg/litre nitrate standard. Phosphate fertilisation shall need to be in equilibrium in 2015 (60 kg P_2O_5/hectare); this will soon be the limiting factor, and will determine the level of fertilisation. In particular, this will ultimately result in a reduction in the use of animal manure. The effects on yields will probably be restricted, since current application levels are often excessive; however, this will increase the risk of poor seasons. This will be due to the reduced inability to use fertiliser to correct extreme circumstances, such as excessively dry or wet weather. The application of animal manure will be restricted to 170 kg N/hectare. The use of animal manure will be related to the price of fertiliser. A higher price of fertilisers increases the economic appeal of animal manure. The type of animal manure that is used will largely depend on the economic strength of the animal sector, since the livestock sector incurs costs in the disposal of manure. These costs represent income for the arable sector (De Hoop et al., 2004). The ban on spreading animal slurry during the autumn results in the reduced use of animal manure on clayey soils, since farmers are unable to access the land in the spring.
All in all, the general consequences of the manure legislation are not unfavourable, since arable farmers can still reduce application levels. However, problems are anticipated for arable farms on sandy soils. Further amendments will follow should it transpire that the manure legislation is unable to ensure for the achievement of the Water Framework Directive targets.

Climate policy

In the longer term, climate changes could have significant consequences, i.e. a shortage of clean fresh water, flood risks, food shortages, and salinisation as a result of the rising sea level. So as to restrict these consequences, it will be necessary to gain an insight into the risks, and to implement the necessary measures. These developments could impose restrictions on the

Dutch arable sector, for example with respect to the water used for irrigation. However, it is a moot point whether the effects of the changing climate will exert a pronounced effect on the arable farming sector in the years before 2015.

Energy

A similar issue relates to the depletion of the world's oil stocks. This will result in price increases for products such as transport fuels, artificial fertiliser and pesticides and, ultimately, in the price of agricultural products. However, these developments also offer opportunities for organic and regional products, and for bioenergy.

Pursuant to the EU Biofuels Directive the member states are under the obligation to replace 2% of their transport fuels with biofuels in 2005, increasing to 5.75% in 2010. Although oilseed rape offers an opportunity for the Netherlands, during the past decades the average margin on rape was lower than that for cereals (Janssens et al., 2005). Tax measures favouring biofuels of the nature of those already implemented in Germany and France could act as an incentive for oilseed rape cultivation. The prospects for the cultivation of sugar beet for bioethanol would appear to be limited in view of the expected low margins (Langeveld et al., 2005).

5.2.3 Space

Dutch arable farming is concentrated in the marine clay areas of the provinces of Groningen and Friesland, the south-western Netherlands, the peat district, and the IJsselmeer polders (figure 5.5). From an urbanisation perspective, these areas can be counted amongst the regions exposed to underpressure rather than overpressure; they are located relatively far away from the Randstad conurbation, and do not number amongst the most appealing areas for rural housing, business, or recreation. Consequently, the option value of land in these regions is the lowest in the Netherlands. Urbanisation is not expected to result in major changes in this situation. When viewed from this perspective, the sector will not be forced out of the majority of its locations for the benefit of what are referred to as 'red' functions.

However, urbanisation pressure for housing, business or recreational purposes is greater in the more dispersed arable-farming regions in the Randstad conurbation and to the south of the conurbation in the Province of Brabant. The same is also true for the smaller arable-farming regions in the provinces of Drenthe and Limburg, which have more appeal for rural housing and business as a result of their location in attractive areas with a great deal of nature and high landscape values. Consequently, the value of the land can remain relatively high, thereby impeding increases in scale.

In their battle for the relatively scarce land in the Netherlands, the arable farms primarily encounter competition in the land market from other agricultural sectors such as livestock farms. The arable farming sector has more difficulty with Dutch land prices than other agricultural sectors, which are as such less dependent on the acreage. It should be noted that as a result

of the dairy quotas, the competition with the dairy livestock sector is restricted to those farms that (are forced to) relocate.

5.2.4 Technology

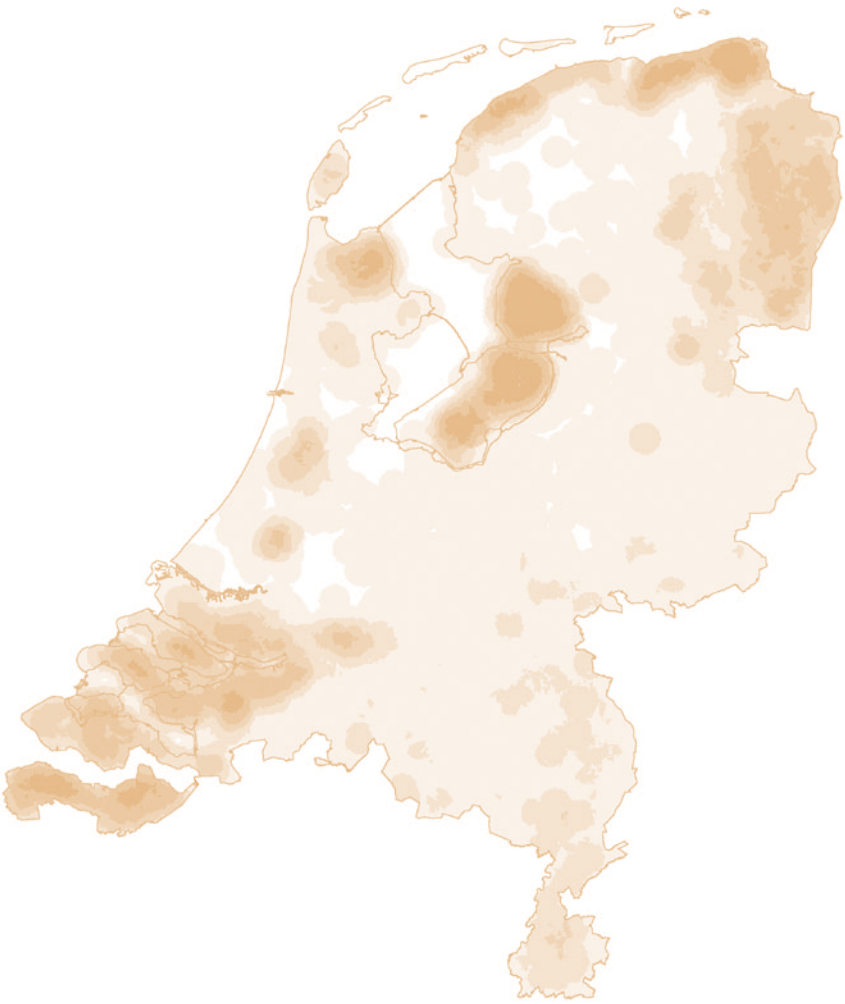
Two technological areas are of importance to arable farming. The first relates to ICT, which has already entered into wide-scale use. The external relationships of arable farms will become even more digitalised. More opportunities will become available for precision agriculture during the coming fifteen years. It would appear that in the coming ten to fifteen years, automation will boost the current trends towards increases in scale and efficiency improvements.
In principle, biotechnology constitutes a second important development for arable farming. Its implementation can result in higher yields and the more efficient use of cultivation aids. Biotechnology is also being used in a search for improved or new products that can open up extra sales opportunities (Langeveld et al., 2005).

Satellite signals

Satellite signals can be used to make detailed records of information about fields that provide for the implementation of suitable cultivation measures. Tractors and other farm machinery will no longer need tracks to travel in straight lines, traverse fields in parallel lines, and maintain a fixed pattern of tracks across the fields. In addition, it will also be possible to prepare detailed maps of soil variables and crop yields. Measurement-instrument technologies are being developed that will provide for the accurate and rapid provision of soil information for complete fields.
At present, the primary applications of GPS (Global Positioning System) are in the areas of tractor and farm-equipment navigation, spreading artificial fertiliser, taking soil samples, and yield mapping. Precision agriculture will provide for the improved tailoring of the dose, time of application and, possibly, the form (or variety) of the seed (material), the nutrients, pesticides and mechanical weed control to the spatial variation within fields, the time variation within fields, and the variation between years. This will result in an improved utilisation of cultivation aids, and will make a major contribution to the reduction of the use of nutrients and pesticides by the authorities and the customers; in many instances, it will also result in a lower overall use.
In the first instance, contractor companies in particular will make use of precision agriculture. GPS will become a standard item of tractor equipment. The development of robotisation will take some time. Autonomous vehicles will become technologically feasible. Short-term opportunities are offered in the control of diseases by means of sanitation, i.e. the removal of (potential) sources of infection. The automated performance of specific disease-control operations can reduce the dependency on chemical agents, reduce their use, and create an economic added value for the introduction of robotisation.

Figure 5.5

Arable-farming regions (based on DSU/ha; the darker the area, the more DSU/ha)
Source: Alterra.



Biomass

Arable farming produces a major proportion of the total Dutch biomass material. A large proportion of this material originates from the cereals, sugar beet and potatoes supplied to the processing industry. The crop residues remain in the agricultural sector. Vegetable biomass, in particular, is of relevance as a supply of energy and raw materials for chemicals. The value of the harvested biomass largely depends on the composition of the constituents, the ability with which they can be separated, and their purity. The processes required to convert beet sugar, potato starch and rape oil into fuels or raw materials for chemicals differ from those required when wood chippings, wheat straw or vegetable, fruit and garden waste are used as the raw material for biomass. Within the near future, farmers could have the technology at their disposal for the local conversion of biomass into fuels, potting mixtures, concentrated manure, or animal feed (Langeveld et al., 2005).

All vegetable biomass offers the potential for processing into fuels or raw materials for chemicals. Sugar, starch and oil-rich crops offer advantages for transport fuels as compared with crops containing large amounts of lignocellulose. However, from an energy and commercial perspective, the combustion of wood cultivated in the form of short-cycle crops or fibrous crops in combined heat and power installations would appear to be more promising. In fifteen years' time, the use of existing biomass (wastes), the production of which is usually linked to the cultivation of food and animal feed, could make a contribution of a maximum of a few percent to the total energy and chemicals raw-material requirements.

The processing companies produce another component of the locally-produced biomass (sugar beet, potatoes, cereals, oilseed rape), and often imported biomass (cereals, cocoa beans, oil seeds, extracted soymeal, vegetables, fruit, etc.). These residual products are relatively large in quantity, exhibit their own processing dynamism, and are of reasonably consistent composition. For this reason, these residual products offer a greater potential for processing into higher-quality products as compared to farm biomass. Cultivation solely for energy purposes would not appear to be of economic interest in the Netherlands; a link with another function, such as water purification, recreation, water storage or the use of marginal land would appear to offer better prospects.

Genetically modified crops

Genetic modification can exert an influence on the quality and quantity of the production of arable crops. The majority of the world's genetically modified crop developments are intended to combat diseases and infestations, and the incorporation of resistance to herbicides and mould currently accounts for half of all modifications. The possible benefits resulting from the reduced use of crop-protection agents need to be weighed against the potential risk of the development of disease resistance, the risk to biodiversity, and the possible environmental disadvantages. The innovations in this

area are taking place outside the Netherlands, as a result of which the control of their application in and by the Netherlands is only limited. Genetic modification is also being used for the achievement of higher yields of crops, the creation of other ratios of nutrients in plants, and the production of medicines.
New varieties that are being developed devote due attention to the growth of the crops in an endeavour to meet the need for the sustainable use of water and soil nutrients. Genetic-modification developments are in part focused on the improved adaptation of crops to specific water and soil qualities. From a technological perspective, a great deal is feasible in the area of genetic modification. Genetic modification is, to some extent, increasingly becoming a standard improvement technique that offers a number of major benefits (rapid, precise, the retention of the other agronomic properties), whereby any potential disadvantages can be estimated case by case. Nevertheless it remains doubtful if applications of genetic modification for food crops will be accepted by society.
Consequently, one of these questions relates to whether the traditional and organic agricultural sectors will be able to live in harmony with the cultivation of genetically modified organisms (GMO cultivation). This parallel existence is also referred to as 'co-existence.' At present there is no commercial GMO cultivation of crops in the Netherlands, and only a limited number of small-scale field trials are in progress.

'Post harvest' technologies
The unavoidable variation in and unpredictability of the yields and product specifications of crops grown in the open (in addition to arable farming, the outdoor cultivation of vegetables) offers prospects for technological developments in the post-harvest process. This phase is of importance to the quality of the product. The characterisation and prediction of the quality parameters will provide for the improved utilisation of products. Examples of these parameters are the monitoring of the micro-organisms that cause spoilage and human/animal toxicity and the linkage to new storage conditions (CA/MA storage, the addition of specific antagonists, etc.). This will be accompanied by developments in logistics processes that will render the provision of new applications and services to customers a feasible proposition. In addition, the replacement of human operations achieved by these technological developments will increase the objectivity and capacity of the processes. This will also contribute to the quality, the utilisation of the raw material and the reduction of the cost price, whereby the latter will be subject to the proviso of adequate economies of scale.

In conclusion
Technology possesses a great potential in arable farming. This relates both to process innovations and to new applications for products. Not all of these opportunities will be economically feasible in the Dutch context. The primary sector is confronted with narrow margins. It is estimated that the introduc-

Table 5.4

Breakdown of the added value and employment (alu) in the arable farming complex, 2003 and 2015

	Added value				Employment			
	2003		2015		2003		2015	
	€ million	%	€ million	%	alu	%	alu	%
Arable farming, total	1,007	22	1,101	22	20,366	27	16,581	26
of which: potatoes	465		545		-		-	
sugar beet	147		84		-		-	
cereals	105		145		-		-	
Processing, total	1,270	27	1,584	31	14,848	20	10,823	17
of which: cereal processing	60		159		1055		883	
sugar industry	335		364		687		469	
flour processing	183		260		1,515		1,266	
margarine, starch, other industry	353		435		6,973		4,812	
potato processing	266		366		4,618		3,393	
Delivery , total	1,422	31	1,454	29	24,170	31	21,238	32
of which: agricultural services	47		47		1,324		1,218	
wholesale	306		314		6,553		6,123	
banks, insurance	358		368		6,023		5,629	
Distribution	963	21	976	19	16,888	22	15,562	24
Agro-complex, total	4,662	100	5,089	100	75,677	100	64,204	100
In % of national agro-complex	19.7		18.9		19.1		18.3	
Export dependency (%)	69		68		71		70	

Source: LEI.

tion of precision agriculture could increase this sector's yields by 10-20%. However, it is doubtful whether the primary sector can make the necessary investments. A range of technological innovations is still feasible in the processing industry (with a large-scale infrastructure), although these will probably have no influence on the demand for (types of) raw materials: the cost price will be *the* decisive factor for the primary sector. The processing industry will continue to source its raw materials from the Netherlands for as long as these are available at low costs; higher costs will result in the industry importing its requirements.

5.3 Prospects

5.3.1 General

Although the prospects for the Dutch arable farming complex are not favourable, the complex will not enter a rapid decline. Pursuant to the reference scenario, the nominal increase in the added value of the arable farming complex will amount with almost 10%, to more than € 5 billion, in 2015 (table 5.4). During the same period, the employment offered by the complex will decline by about 15%. This decline will largely be due to the continuing increases in scale and the expected fall in the number of arable farms. Within the total agricultural complex, the added-value and employment shares of the arable farming complex will decrease by about 1%-point. Within the arable farming complex, the primary production's share of in excess of 20% of the added value and more than a quarter of employment will remain at approximately the current level. The arable farming complex' current dependency on exports (about 70%) will remain virtually unchanged.

The more than saturated markets for products such as ware potatoes and onions as experienced in 2004 do not encourage expansion. The production of the potato-processing industry would appear to be stabilising at about three million tonnes. Within the short term, the acreage used to cultivate unregulated crops could fluctuate, whereby the price formation in Western Europe – and possibly elsewhere – will in part determine the actual acreages. Major shifts and expansions in the acreage of unregulated crops are not expected, in part due to the investments that have been made in buildings and mechanisation.

The increases in scale and internationalisation of the processing industries could result in the transfer of part of specific crops abroad. This could be an issue with the cultivation of potatoes for processing into potato products (such as chips), where there are possibilities for relocation to France and Poland. However, the Netherlands has the benefit of its strong seed-material sector, an important link in the chain. This sector could expand as a result of opportunities in the markets of the new member states.

The chain's quality management is focused primarily on fresh produce, such as ware potatoes, although the control measures also extend to processing companies. The increasingly stringent requirements imposed on arable farms by the international processing companies and the chain give cause

to the need for further professionalisation and increases in scale. The trend towards increases in scale, contract cultivation and high investments in harvesting equipment could offer scope for harvest chains in which the customers assume the responsibility for the harvesting and transport of the crop from the growers. This is already a widely-used procedure in the canning industry. There could be opportunities for the adoption of this approach for sugar beet and, in the longer term, for potatoes for the processing industry.
In general, contracts offer certainty with respect to sales; however, other risks are increasingly being borne by arable farmers. For this reason, the coverage of risks is acquiring an increasingly important role, for example by means of pools and income insurances. Joining forces in the form of collaboration between growers could offer an alternative for products that are either supplied fresh to consumers or undergo little post-harvest processing (such as potatoes, onions, and vegetables). However, associations of this nature will usually offer insufficient scope for export products. The sector is confronted with other Dutch sectors that have a stronger competitive position in the land market. This is in part the reason for the inability of the arable farming complex to make any significant use of the benefits offered by increases in scale in a period in which the situation in the European and international markets is changing, and in which fewer opportunities are available for the retention of the level of the operating results by means of a further intensification of the crop plan. Nevertheless, the arable farming complex will retain the larger part of its current acreage during the coming years. In particular, a decline is expected in those crops for which the amendments to EU policy make such a reduction necessary. This is, in the first instance, applicable to the cultivation of sugar beet; however, the acreage used to cultivate starch potatoes will also decrease, since with higher yields the permitted quantity (the quota) can be grown on fewer hectares.

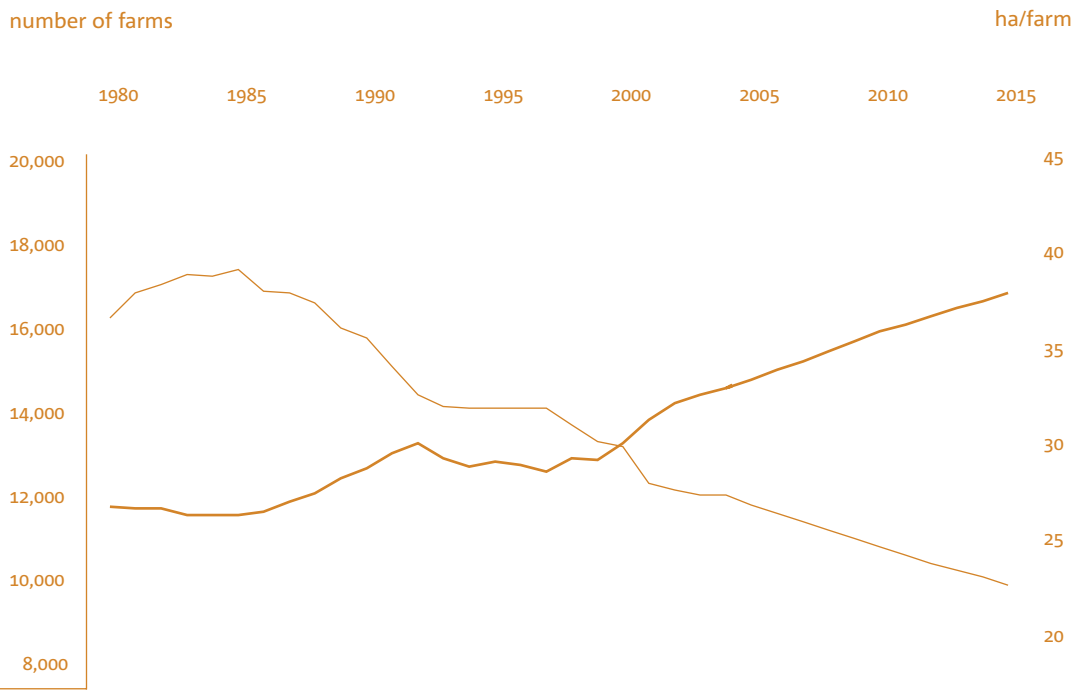
5.3.2 Farms

The forecasts indicate that in 2015 the number of arable farms will have declined to just above 10,000 (figure 5.6). The actual decline during this period will depend largely on the continuation of the smaller farms. During the coming years, the challenge facing many new – and existing – arable farmers will be to maintain their income at the current levels. In the past, many arable farmers have expanded their farms, sometimes in increments, sometimes in a few major steps. This process will continue, in particular in the large-scale agricultural areas. Agricultural land prices will come under pressure, since the margins on many crops are – or will become – narrow as a result of the low prices due to market developments and policy reforms. The increasing capacity of machinery will ensure that increases in scale remain an option for farms with the appropriate operating results. However, this will be subject to the proviso that virtually no investment in machinery or buildings is needed, and that no additional perma-

Figure 5.6

Number of specialised arable farms and hectares per farm, 1980-2015
Source: Statistics Netherlands (CBS) and LEI.

ha of arable land per farm
number of farms



nent employees are required. This is due to the fact that increases in scale are beneficial solely when they result in a decrease in the fixed costs per hectare. It is not easy to achieve this cost reduction when land needs to be purchased. For this reason, arable farmers are increasingly endeavouring to achieve increases in scale by loose or fixed leases of land. However, the disadvantage of loose leases is the concomitant risk of phytosanitary and other crop-cultivation shortcomings. Loose leases appeal to farmers without a successor, and to part-time farmers who do not wish to sell their land (yet). They are either unwilling or unable to make the labour efforts required for an optimum operation of the farm (or to continue to make this effort). In so doing, farmers expanding their farms benefit from others who are running theirs down or are active as 'hobby farmers.'

Increases in scale – provided they are approached in the appropriate manner – result in increased efficiency. The same effect can sometimes be achieved by collaboration between farms, whereby a wide range of intensity is conceivable. Two or more arable farmers who purchase a large potato lifter will be able to reduce the labour and machine costs incurred in lifting the same acreage of potatoes. A much more far-reaching form of collaboration is a complete merger of farms. On occasion, the resultant efficiency improvements will cause some employees to become superfluous to requirements. This surplus labour can be deployed outside the farm or assigned new and additional tasks on the farm, such as specialisation (a larger proportion of intensive crops), diversification (nature management, a farm store, a farm campsite, a care farm), or more in-depth operations (sorting, washing, packaging). Collaboration between arable farms and other types of farms, such as dairy farms, is also an option in mixed areas. The resultant exchanges of land, machinery and labour can result in cost reductions and increased production per hectare (crop-plan effect).

The combination of an (arable) farm with a job away from the farm or a supplementary operation (care, recreation, farm store) and collaboration with other arable or livestock farmers are both options for the retention of the income at the current level and the improvement of the prospects for the farm's continuity. These options vary from area to area, and they make the necessary demands on the farmer: flexibility, creativity, good communicative skills, business insight, frequently the surrender of a degree of autonomy, the search for a new approach to the performance and division of the tasks, and similar. Not all farmers will possess these properties to the extent required to be able or willing to opt for collaboration or other alternatives. Self-knowledge is essential for the ability to give careful consideration to these choices. Fortunately, interest in farmers both as entrepreneurs and as people is increasing, as a result of which more guidance is now available for personal choices of this nature.

CONTINUED DEMAND FOR HEALTHY, FRESH, TASTY AND ATTRACTIVE PRODUCTS

Chapter 6

Open field horticulture complex

6.1 Current position

6.1.1 General

The open field horticulture complex encompasses a range of sectors, i.e. the vegetable, fruit, bulb and tree nursery sectors. In addition to these primary operations, the open field horticulture complex also extends to the vegetable and fruit processing industry and the supply and distribution companies serving the sector, such as the providers of professional services (inclusive of the auctions). With a 10% share of the added value, this is the smallest national sub-complex. The significance of the income from exports is substantially greater than for the overall agricultural complex. During the period between 1995 and 2002, some 87% of the open field horticulture complex' added value related to exports. In 2003, this declined slightly to 85%. Figure 6.1 gives figures for the imports and exports of a number of product groups.

Although the primary sector's share of the total added value of the open field horticulture complex declined slightly during the period between 1995-2003, its 65% share is nevertheless relatively large. During the aforementioned period, the added value of the open field horticulture complex increased from € 1.8 billion in 1995 to € 2.3 billion in 2003. Employment offered by the complex stabilised at 42,000 alu; in addition, the employment offered by the various sectors also remained virtually constant (figure 6.2). The various sectors in the open field horticulture complex exhibit major differences in the movements of the acreage and the number of farms specialised in the cultivation of the relevant crops (table 6.1). A striking feature of these figures is the relatively constant number of arboricultural farms as compared to the greatly decreased numbers in the other sectors in this complex.

6.1.2 Open field vegetables

The competitive position of the Dutch open field vegetable cultivation sector has deteriorated in the past years. The Dutch supply, processing and marketing chain is highly developed. The internationalisation of the supply and processing industries has reduced the Dutch cultivation sector's lead; foreign growers also have rapid access to new technologies and information. The Netherlands' main competitors in its important German market are the German producers, who have expanded their acreage in the past few years.

Highlights

Current position

Powerful international position in the markets for bulbs and trees

Total of 75,000 hectares; fruit acreage of fruit has declined, bulb and tree nursery acreage has greatly increased

Broad distribution throughout the Netherlands, with a concentration in specific regions: vegetables in West Friesland, the Noordoost polder (Northeast polder), the west of Brabant and Zuid-Beveland; fruit cultivation in the Betuwe and the Flevopolder; bulb culture in the north of North Holland and the bulb-growing area in South Holland; tree nursery in Boskoop, Opheusden and Haaren

A total of 6,700 specialised farms

Varied operating results, in general better for arboricultural and bulb farms

Driving forces

Growth in demand is furthered by increasing prosperity

Opportunities for sales of bulbs and tree nursery products in Eastern Europe and China

Increasing competition in vegetable and fruit cultivation

Increasing costs and cultivation restrictions due to minerals and pesticides policies

Water-quality requirements in the permanent bulb-cultivation areas on sandy soils give cause to measures at a regional level

Alternative claims on the land in concentrated bulb cultivation and tree nursery areas

Sector has a powerful position in comparison with other agricultural operations

Expansion dependent on spatial planning

Innovations in areas such as new varieties, mechanisation, cultivation technologies, and solutions for environmental problems

Prospects

Favourable prospects for sales of bulbs and trees

Increased foreign cultivation of vegetables and fruit

Success of new apple varieties of great importance to fruit cultivation

Employment offered by the sector can remain at the current level

Vulnerable to the availability of labour during the harvest

Increases in scale, collaboration in the chain and shortening of the chain

Substantial decline in the number of farms

Expansion of arboriculture in the current regions of concentration, provided that the regional spatial planning offers the necessary scope

During the period between 1990 and 2004, the total acreage (intensive open field cultivation) devoted to vegetables decreased by about 7% to 19,860 hectares (table 6.1). The acreage fluctuates from year to year. The number of farms has declined by almost 25% since 2000. During the period between 1990 and 2004, the average area of the specialised vegetable farms doubled to about 7 hectares.
The availability of sufficient labour was a problem for a number of years; however, this has recently been improved with the introduction of the *Tijdelijke tewerkstelling van buiten de EU afkomstige arbeidskrachten* ('Temporary employment of workers from outside the EU') regulations. The difficulties in recruiting sufficient labour were due to the unappealing working conditions, in particular during planting and the preparation of the produce for the auctions.

6.1.3 Fruit

The Netherlands is a relatively small fruit producer. However, the country *is* a major apple and pear exporter, largely as a result of transit shipments of produce from third-party countries. Dutch sales of fruit depend on a small number of markets: Germany is a major customer for apples, the United Kingdom for pears. The Netherlands has lost some EU market share to Italy and Belgium/Luxembourg. This relates primarily to apples; the Netherlands has acquired a powerful market position in the market for pears, in particular in the United Kingdom.
The sales of fruit exhibit similarities with those of vegetables. During the past few years, some farms have joined forces in their marketing, whereby the 'Fruitmasters' company plays a leading role. The number of fruit farms has declined more rapidly than the acreage. The average area of the specialised fruit farms is now about 10 hectares. Investments by the fruit-cultivation sector have recovered following the reasonably good profits in the past few years. The sector has also invested in new apple varieties, and 40% of the current acreage is now used to cultivate Elstar, with a further 30% for Jonagold.
The farms are increasing in scale, whilst smaller farms are discontinuing their operations. During the past twelve years, the price of apples was sufficient to cover the costs in only three years. This poor price formation is due to a number of causes, such as increased international competition and, to a lesser extent, a shift in Dutch consumption patterns. The national consumption of apples decreased from almost 32 kg to 25 kg per household in the period between 1994 and 2003. The consumption of apples and pears is under pressure as a result of their continuing substitution by other (often exotic) fruit and snacks. In general, the cost price of Dutch apples is high due to the substantial labour costs. Some competitors can offer fruit of a comparable quality and flavour. EU imports from the southern hemisphere have increased, in part as a result of the low exchange rate of the US dollar. Increases in scale have developed less rapidly in pear cultivation than in apple cultivation. This is due to the better prices obtained for pears, in

Figure 6.1

Dutch imports and exports of a number of open field horticultural products, averages of 2003 and 2004

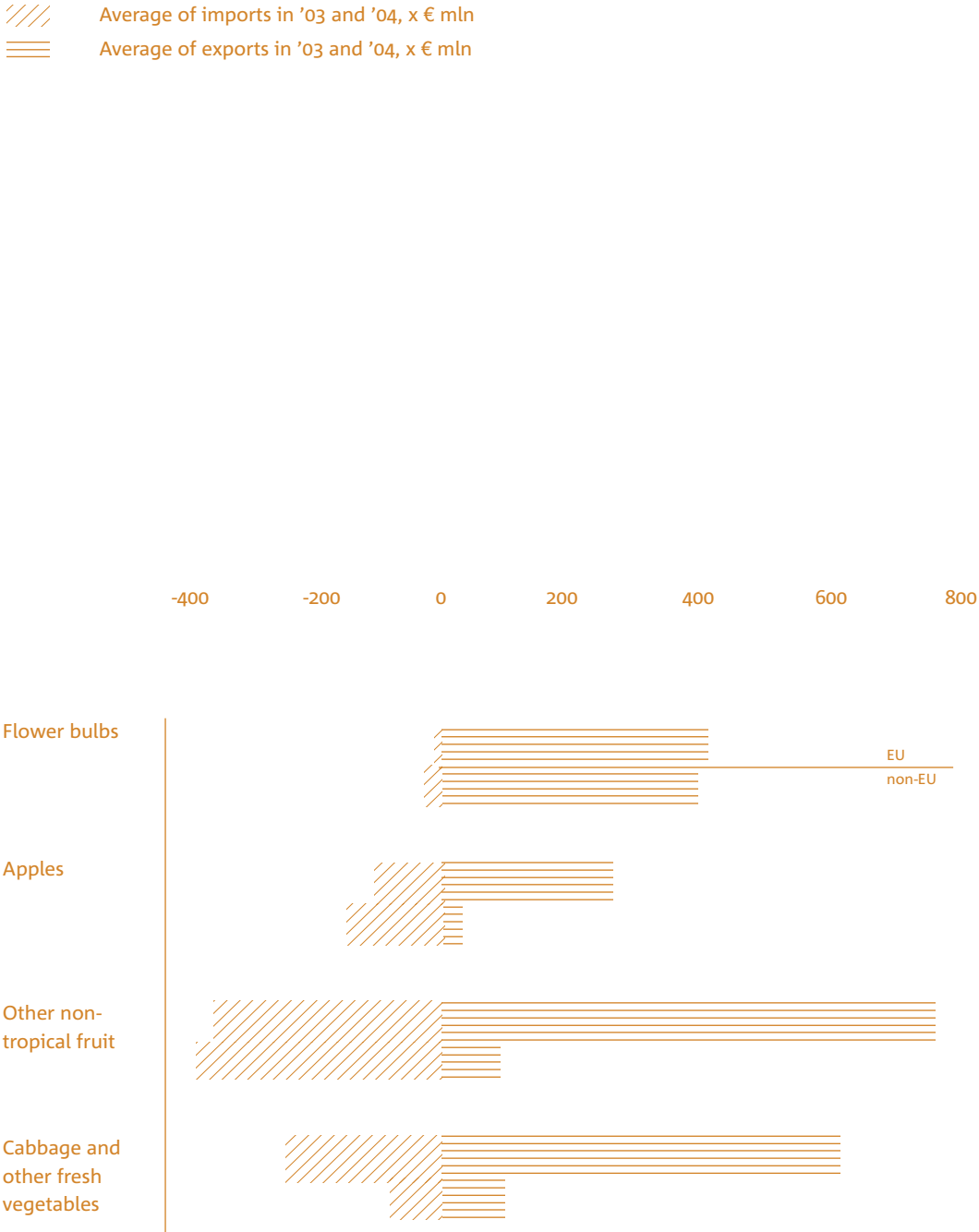


Figure 6.2

Breakdown (in %) of the added value and employment in the open field horticulture complex, 1995 to 2003.

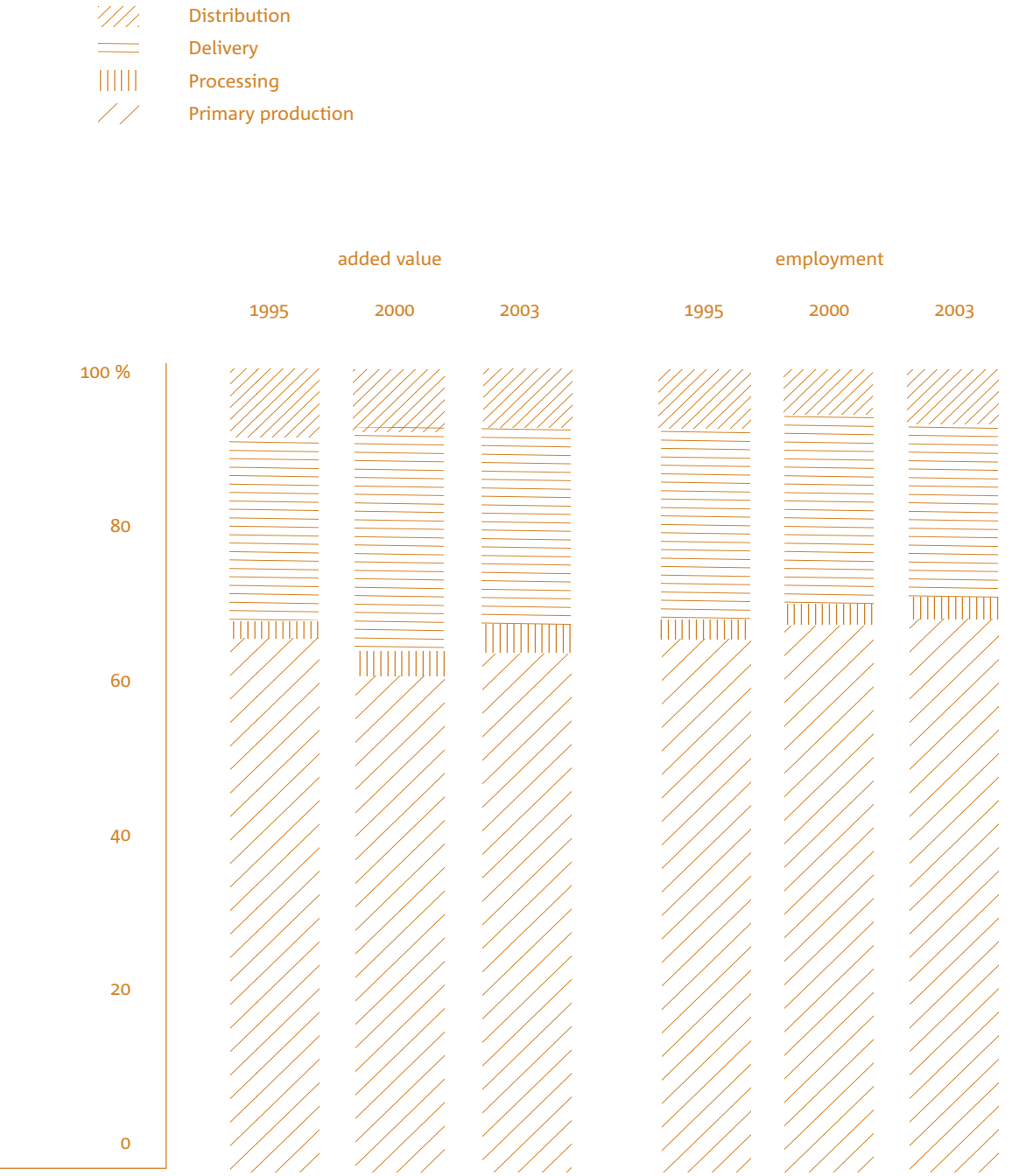


Table 6.1

Developments in acreage (hectares) and numbers of open field horticulture holdings

		1990	1995	2000	2003	2004
Number of specialised holdings						
Open field vegetables		2,500	2,000	1,460	1,200	1,120
Bulbs		1,750	1,440	1,340	1,190	1,120
Fruit		2,810	2,750	2,210	1,870	1,860
Tree nursery		2,930	2,810	2,810	2,630	2,600
Acreage						
Open field vegetables		21,320	21,640	20,050	20,850	19,860
incl.	strawberries	1,870	1,760	1,750	1,920	2,130
	lettuce	960	1,040	1,090	1,360	1,370
	cauliflower	2,370	2,430	2,160	2,330	2,320
	cabbage	2,580	2,920	2,540	2,690	2,570
	leeks	2,870	3,850	3,180	3,240	3,040
	Brussels sprouts	4,800	4,390	4,830	4,230	3,470
Fruit		23,250	23,130	20,610	18,770	18,720
incl.	apples	16,320	15,310	12,840	10,300	10,220
	pears	5,120	5,890	6,020	6,390	6,490
Bulbs		16,320	18,090	22,540	24,540	23,600
incl.	tulips	6,830	8,030	9,710	11,020	11,050
	lilies	2,410	3,300	5,070	4,940	4,590
Tree nursery		8,740	9,770	12,640	13,150	14,120
incl.	avenue and park trees	1,800	2,410	3,160	3,460	3,590
	forest trees and hedging plants	2,070	2,210	2,290	2,380	2,300
	ornamental conifers	1,340	1,450	2,340	2,550	2,810
	other ornamental shrubs and climbing plants	1,200	1,270	1,790	1,890	2,300
	pot and container plants	420	790	980	930	1,350

Source: CBS Landbouwtelling (agricultural census).

particular for the Conference variety. Conference has for many years been the major pear variety cultivated in the Netherlands, and in 2004 69% of the acreage was devoted to this variety. In the years since 2000, the total pear acreage has increased by some 500 hectares to approximately 6,500 hectares in 2004. Although the global production of pears doubled during the years between 1991 and 2001, the international competition in pear cultivation is not as fierce as for apples. The Conference variety is ideally suited to cultivation in the Dutch marine climate. Other countries are unable to cultivate Conference pears of a comparable quality, either because their climate is too cold (Poland) or too hot (Spain).
During the past few years, the unavailability of sufficient seasonal labour has impeded the sector's increases in scale. This has improved now that growers are able to make use of asylum-seekers and workers from Eastern Europe are permitted to assist in the harvest.

6.1.4 Bulbs

The Netherlands has a dominant position in the world's bulb cultivation and trading markets. The Dutch share in the world's cultivation of bulbs is 70%, and in the world's trade no less than 80%. The cultivation of bulbs in the southern hemisphere is also almost entirely in Dutch hands. In fact, the Dutch bulb sector is confronted with virtually no international competition. Three-quarters of the total Dutch production of bulbs is exported immediately, part of which is destined for forcing by foreign producers and part for dry sales. The remaining quarter initially remains in the Netherlands. Of these bulbs, 95% are forced to grow flowers, and the remaining 5% are destined for dry sales. The majority of these bulb flowers are then exported. The most important markets for Dutch bulbs are the United States of America, Japan, and the larger EU member states, i.e. Germany, the United Kingdom, Italy, and France. New markets in Eastern Europe and the Far East would appear to offer interesting opportunities.
The export value of Dutch bulbs has for many years exhibited an annual growth in excess of 3%. However, in the 2002/2003 and 2003/2004 seasons, the export value was lower than in the 2001/2002 season. This disappointing development was ascribed to the poor condition of the global economy and the unfavourable exchange rate of the euro against the dollar.
The disappointing exports imposed pressure on prices, and for the first time in many years the acreage used for the cultivation of bulbs decreased in the 2004/2005 season (table 6.1). The most important crops – and the crops exhibiting the most rapid growth – are tulips and lilies. The number of farms cultivating bulbs has declined to less than 2,500, and the number of specialised farms to about 1,100.

6.1.5 Tree nursery

The tree nursery sector has been one of the most successful sectors in the Dutch agricultural and horticultural industry during the past decades. The sector's size has increased as a result of a major expansion in the product

range. This has also resulted in an extremely varied sector. The Netherlands is the major EU exporting country, followed by Belgium and Italy. Exports are usually arranged by the producers; the tree nursery sector does not have a dominant trading party that provides for exports. Germany is the major customer, receiving about 35% of the Dutch tree nursery production.
Sales of tree nursery products are more sensitive to economic conditions than those of other sectors. The cutbacks in government budgets in recent years have resulted in a disappointing demand for growers' products for the institutional market (avenue and park trees). In addition, consumers (particularly in Europe) are also reserved in their purchases. Following many years of increasing acreages, the area devoted to tree nursery cultivation decreased slightly in 2004. As a result of the somewhat poorer operating results achieved in the past few years, the production capacity has automatically adjusted to the changed market conditions. The sector has firm foundations by virtue of its supply of a broad range of products. The location of the Netherlands and the country's excellent logistics enable the producers to make rapid deliveries of the products to the required location.
The acreage used for tree nursery cultivation has increased greatly since 1990, and now amounts to some 14,000 hectares (table 6.1). This, in combination with a slight decline in the number of farms that has developed only in the past few years, is indicative of evident increases in scale. The size of the average tree nursery farm is now about 5 hectares.

6.2 Driving forces

6.2.1 Market, CAP and WTO

Consumer preferences are changing. Vegetables and fruit sales are affected by the increasing consumption of ready-to-use products. Food safety and quality are both major issues. The parties in the chain (the retail trade) interpret these requirements by requiring the growers to arrange for certification, for example Eurep-GAP (Good Agricultural Practice) and – specifically for Germany – the QS-system (*Qualität und Sicherheit*).
The entrance of new member states, such as Poland, to the EU will result in even more competition. The further professionalisation of cultivation and sales operations in Poland and other Eastern European countries could, in the longer term, result in these countries offering formidable competition for the Netherlands due to their much lower labour and land costs. China is also a potential competitor; during the period between 1999 and 2003, China doubled its exports to the EU every year. The most important apple varieties (Fuji and Gala) grown in China are sweeter than the Dutch varieties, and consequently less compatible with the preferences of European consumers. For this reason, China is not a direct competitor for the Dutch varieties, although it could constitute a threat in the event of substitution or changed consumer preferences.
Convenience, experience and exclusivity are trends of importance to sales of ornamental products. Bulbs offer a deferred promise, whilst consumers wish to have a visually appealing product immediately on their purchase.

For this reason, bulb flowers are more compatible with prevailing trends. Pot and border plants and cut flowers constitute the competition for bulbs and bulb flowers.
The market developments are a significant favourable factor for the tree nursery sector. The increasing competition resulting from the expansion of the EU may pose a temporary threat. It is expected that in the longer term the increasing production will be necessary to meet the growing national demand resulting from increasing prosperity. The sales of ornamental products will become more sensitive to purchasing impetuses imparted by both the weather and campaigns at DIY stores. The structural reduction of government budgets will impede the development of cultivation for the institutional market.

6.2.2 Environment
The minerals policy and the Water Framework Directive will determine where crops are cultivated. Intensive cultivation on land susceptible to leaching will come under pressure of a degree depending on the implementation of measures within the scope of these policies.

The following issues are of relevance to crop protection:
- The sector uses substantial quantities of agents for weed control, disease control, and storage (in particular, in the cultivation of bulbs);
- The risk of contamination of groundwater is appreciable in bulb cultivation areas that have sandy soils in combination with high groundwater levels. Although the bulb sector has implemented drastic measures designed to reduce the use of agents, the increase in the area under cultivation has nevertheless negated these reductions;
- The tree nursery sector makes frequent use of soil disinfection agents;
- It is expected that the European standards will become more stringent; however, the Netherlands already has a more stringent policy for the use of these agents. For this reason, these standards will have little influence, although this does depend on the measures implemented within the scope of the Water Framework Directive;
- A slight increase in the administrative burden will occur due to the new Integrated Crop Protection Order in Council (2005);
- More environmentally-friendly cultivation by the reduction of crop protection agents and the use of mechanical weed control requires a continually increasing deployment of knowledge and alternative agents and methods.

The crop protection agent policy will probably result in higher costs and more restrictions on cultivation, in particular in the bulb sector. Water-quality requirements in the permanent bulb-cultivation areas on sandy soils give cause to measures at a regional level. What are referred to as ‘project farms’ offer an opportunity for a segregation of the water regime in bulb-cultivation fields from their surroundings.

6.2.3 Space

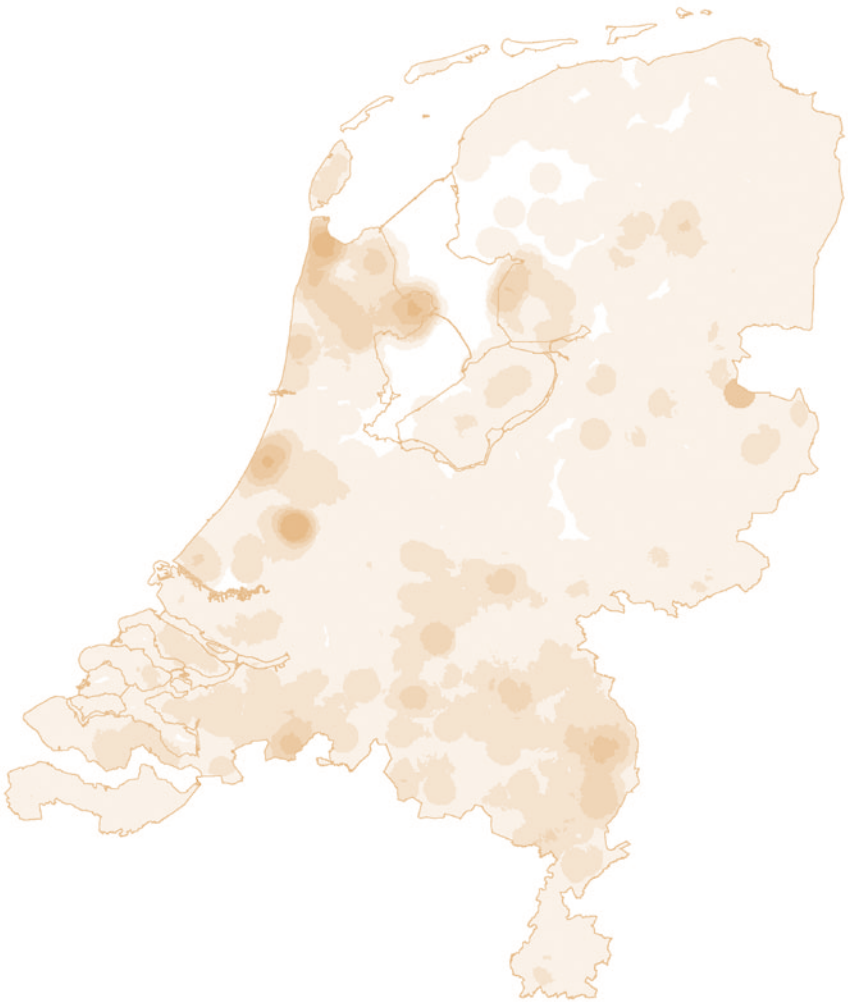
The open field horticulture sector is fairly widely dispersed through the Netherlands (figure 6.3). However, there are evident concentrations of bulb-cultivation operations in the north of North Holland, the bulb-growing area in South Holland, and the *Noordoostpolder* (North-east polder). Many of the open field vegetables are cultivated in West Friesland, the *Noordoostpolder*, and smaller areas in the south-west of the country. Fruit cultivation is primarily concentrated in the Betuwe, Zuid-Beveland, and the Flevopolder. The higher margins per hectare in the intensive ornamental cultivation sector as compared to other sectors will enable the sector to offer reasonable resistance to other claims on the land, certainly in the less urbanised areas in and around the Randstad conurbation. In actual fact, this sector may well drive out other agricultural sectors with lower margins per hectare (arable farming). Consequently, subject to the proviso that the demand exhibits a favourable development, expansion is expected in regions just outside the Randstad conurbation.

The dune-sand soils in the provinces of North and South Holland are ideally suited to the cultivation of bulbs for dry sales and exports. A clean and unblemished exterior is an important sales criterion in the bulb market, and is easier to achieve with sandy soils than with loam or clay soils. However, claims for land in the traditional production areas with permanent bulb cultivation on sandy soils (the bulb region, Kennemerland and the *Noordelijk Zandgebied* (northern sandy region)) have been made for new housing, water storage, nature and landscape management, and recreation. This, in combination with the demand for suitable land for the bulb-cultivation sector, imposes great spatial pressure. The province of North Holland intends to retain the permanent cultivation of bulbs on sandy soil within its confines, as well as offer space for growth by relocating part of this cultivation to other or new production areas. In the other production areas on clay and loam soils (West Friesland, Flevoland) and sandy soils (the north-east and south-east of the Netherlands) bulbs are cultivated according to a 1 in 6 rotation with arable crops and grass. To this end, the bulb farms specialised in the cultivation of tulips and lilies exchange land with or lease land from arable farmers and livestock farmers. Spatial pressure is less intense in these production areas, and there is still sufficient land for the expansion of the bulb-cultivation acreage. It is expected that sufficient land will be available for the required expansion of the bulb-cultivation acreage.

The tree nursery sector exhibits a trend towards concentration. The existing regions are usually full, and are confronted with spatial limits; this is, for example, evident in the Boskoop region. Policy-makers often regard pot and container cultivation as a form of greenhouse horticulture that is undesirable in open regions. Spatial planning can impede the expansion of tree nursery farms in certain areas, but will probably result in clusters of these farms in a number of concentration regions.

Figure 6.3

Open field horticulture regions (based on DSU/ha; the darker, the more DSU/ha)
Source: Alterra.



6.2.4 Technology

Open field vegetables

The technological developments are primarily focused on the substitution of labour, for example during the harvesting and processing of the produce. ICT applications are beneficial to the accessibility of knowledge, contacts, and the partners in the chain.

The harvesting and processing of the crops are particularly labour-intensive activities. Automation can reduce the labour requirements; it will often be necessary to increase the acreage per machine above the customary levels if it is to be possible to recoup the costs incurred in this mechanisation.

Relatively large quantities of water are used for irrigating, watering and rinsing crops. Technologies are being developed that will reduce the quantities of rinsing water by recirculation and reuse, and by the introduction of product cleaning that does not involve water.

The environmental impact will be lowered by using new spray technologies to reduce the drift of crop protection agents, and by the reduction of the dependency on chemical crop protection. Genetic modification could, depending on societal acceptance, also contribute to the reduction of the use of chemicals. A more efficient use of inputs and the more efficient control of the production process could be controlled by GPS positioning.

New packaging and storage technologies are in development. In addition, deep-freeze technology developments currently underway will retain the colour, flavour and nutritional value of the products. A current trend relates to the packaging of all fresh vegetables in MAP (Modified Atmosphere Packaging). This can be a sustainable technology, since the produce is wrapped in biodegradable packing and the shelf life of the produce is prolonged, thereby reducing losses. The Netherlands has a relatively large amount of knowledge of and experience with this technology. Within the Paris-London-Berlin 'fresh-food triangle,' Dutch produce can compete in terms of 'freshness' when ICT and mutual agreements ensure that supply and demand are in equilibrium.

Fruit

The expected developments are:

- Sustainable production: taking account of the landscape, fertilisers, crop protection and water (bioremediation of spraying residues), packaging, residual products, and tracking & tracing;
- Efficiency improvements: increases in scale, mechanisation of labour and other activities, intensification;
- The Netherlands as a 'fruit transit country': logistics will become more important, the retention of product quality in the chain. Improvements in storage technology: the ability to store Elstar, for example, for longer periods of time can enhance the competitive position of the Dutch apple-cultivation sector;
- Response to consumer needs: convenience/health/experience, positioning of products, product range, quality guarantees (process and product quality).

Bulbs

The challenge confronting the sector is to find a solution for the environmental problems caused by bulb cultivation. Work is in progress on solutions involving:

- precision agriculture (for example, weed control);
- image recognition of diseases and infestations (satellite signals);
- greenhouse and forcing systems:
  - picking robots (uniform crops are required) and the individual treatment of plants
  - stringently-controlled greenhouse climates (control based on physiological processes / crop parameters)
  - energy savings
  - water forcing (virtually all crops)
  - multi-layer cultivation and artificial-light forcing (space, energy)
  - logistics: reduced labour needs and more favourable working conditions;
  - watering systems (greenhouses and fields): increasingly refined, using sensors;
- storage chambers: gas composition (quality, diseases and infestations);
- gene technology (constituents, resistances);
- molecular markers + proteins to mark phase changes.

Tree nursery

Endeavours are being made to ensure for sustainable cultivation by the reduction of emissions of minerals and crop protection agents. The improvement of working conditions is also an issue requiring attention. The costs of land, labour, raw materials, knowledge intensification, etc., and the requirements relating to the environment and compatibility with the landscape all impose a heavy burden on the competitive position of individual farms.
So as to reduce the use of fertiliser and emissions of minerals, the sector is endeavouring – together with other open field cultivation sectors – to arrive at equilibrium fertilisation by means of sampling, registration, targeted fertilisation (time, space) and fertigation (water and fertilisation by means of trickle irrigation). It is expected that equilibrium fertilisation of open field crops is a feasible proposition, provided that increased knowledge is acquired about the relationship between plant, soil, and fertiliser. The pot and container cultivation sector will employ recirculation systems that will ensure for equilibrium fertilisation.
Tree nursery products need to comply with specific visual standards and – for exports – stringent phytosanitary standards. Moreover, the products need to be of a certain size. So as to reduce the quantity of the active ingredients and restrict emissions, the sector is seeking solutions in the area of spraying performance, cultivation-free zones, trunk injections, mixing in the potting soil, and biological agents. The selection of crops on the basis of their resistance to disease will also contribute to a reduction in the use of crop protection agents.

The cultivation and processing of tree nursery products will increasingly be mechanised. Precision technology (row fertilisation, trickle irrigation, row spraying, and precision sowing) will play a greater role on the increasingly larger farms. Mechanical weed control (weeding robots) will reduce the use of chemical weed killers. The development of new controlled seed-treatment methods offers opportunities in precision sowing for the forest trees and hedging-plant sector and the cultivation of roses (rootstock) and, in so doing, for more mechanised cultivation methods.
The tree nursery sector produces large amounts of inorganic waste, such as pots and packaging material. The development of biodegradable pots, film, binding tape and root-ball gauze will contribute to a substantial reduction in the amount of waste.
Gene technology will play a role in areas such as the production of fruit trees for fruit cultivation. The development of marker genes for physiological processes, such as the time at which buds become dormant, will improve the determination of the appropriate time to lift crops. The importance of biotechnology to the tree nursery sector is increasing as a result of the need for certainty about high uniform production (virus tests, vitality, rooting guarantees, germination capacity, etc.).

6.3 Prospects

6.3.1 General

Pursuant to the reference scenario, the open field horticulture complex will exhibit a favourable development in the coming years. The opportunities for the expansion of the tree nursery and bulb-cultivation sectors will result in a nominal growth in the economic significance of the entire open field horticulture complex of more than 20% by 2015. Employment offered by the complex is expected to remain virtually unchanged. The complex' share in the total agricultural sector will gradually increase to more than 10% of the added value and more than 11% of employment (table 6.2). The emphasis of these operations will be placed on the primary production, since virtually no processing takes place. The sector's dependency on exports will remain at an extremely high level, and will increase further to almost 90%.

6.3.2 Holdings

Open field vegetables

The internationalisation of the retail trade and processing industry continues to increase. Moreover, they continue to become more concentrated. The remaining retail and processing companies impose increasingly stringent requirements on their suppliers. The opportunities available to Dutch growers for affiliation with a pool of producers for foreign retail organisations would appear to be limited. The marketing organisations are placing a continually increasing emphasis on the supply of larger lots.
It is expected that the increases in scale in the vegetable cultivation sector will continue, in particular as a result of the poor competitive strength of the Dutch open field vegetable sector and the concomitant poor financial

Table 6.2

Breakdown of added value and employment (alu) by sector in the open field horticulture complex in 2003 and 2015

	Added value				Employment			
	2003 € million	%	2015 € million	%	2003 alu	%	2015 alu	%
Open field horticulture, total	1,507	65	1,862	66	28,907	69	28,262	68
incl.: open field vegetables	502		527		5,332		4,653	
fruit	351		392		3,522		3,101	
bulbs	258		373		10,271		10,513	
tree nursery	396		569		9,781		9,995	
Processing, total	62	3	91	3	893	2	824	2
Delivery, total	585	25	679	24	9,322	22	9,466	23
incl.: gas, electricity	19		19		67		78	
wholesale	111		131		1,909		2,018	
banks, insurance	165		193		2,224		2,359	
Distribution	166	7	179	6	2,687	6	2,726	7
Total open field horticulture complex	2,320	100	2,811	100	41,799	100	41,278	100
In % of total agro-complex	9.8		10.4		10.5		11.6	
Export dependency (%)	85		86		88		88	

Source: LEI.

position of many of the farms. The developments will include the specialisation of farms in specific vegetables by means of the lease of land from a number of farms. In addition to these Dutch increases in scale, it is also expected that many farms will open a foreign branch, in part to enable them to deliver produce to their direct customers throughout the year. A substantial decline is expected in the number of specialised vegetable farms (figure 6.4).

Fruit

The developments in the marketing structure contribute to the increases in scale in fruit cultivation. The market (the retail trade) wishes to receive large lots, with reliability of deliveries and fixed (low) prices. The trade is

Figure 6.4

Number of specialised open field horticulture holdings and hectares per holding, 1980-2015
Source: Statistics Netherlands (CBS) and LEI.

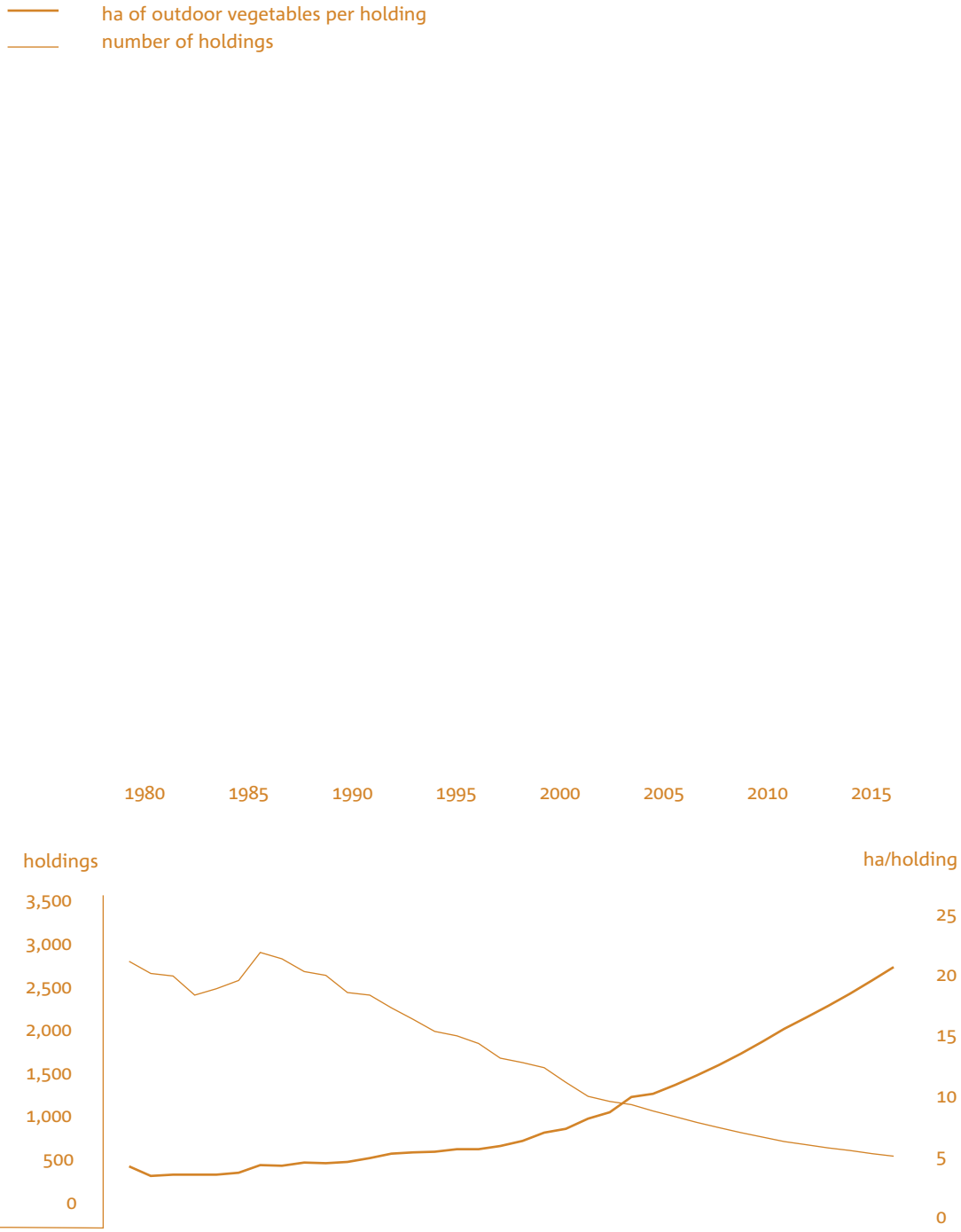
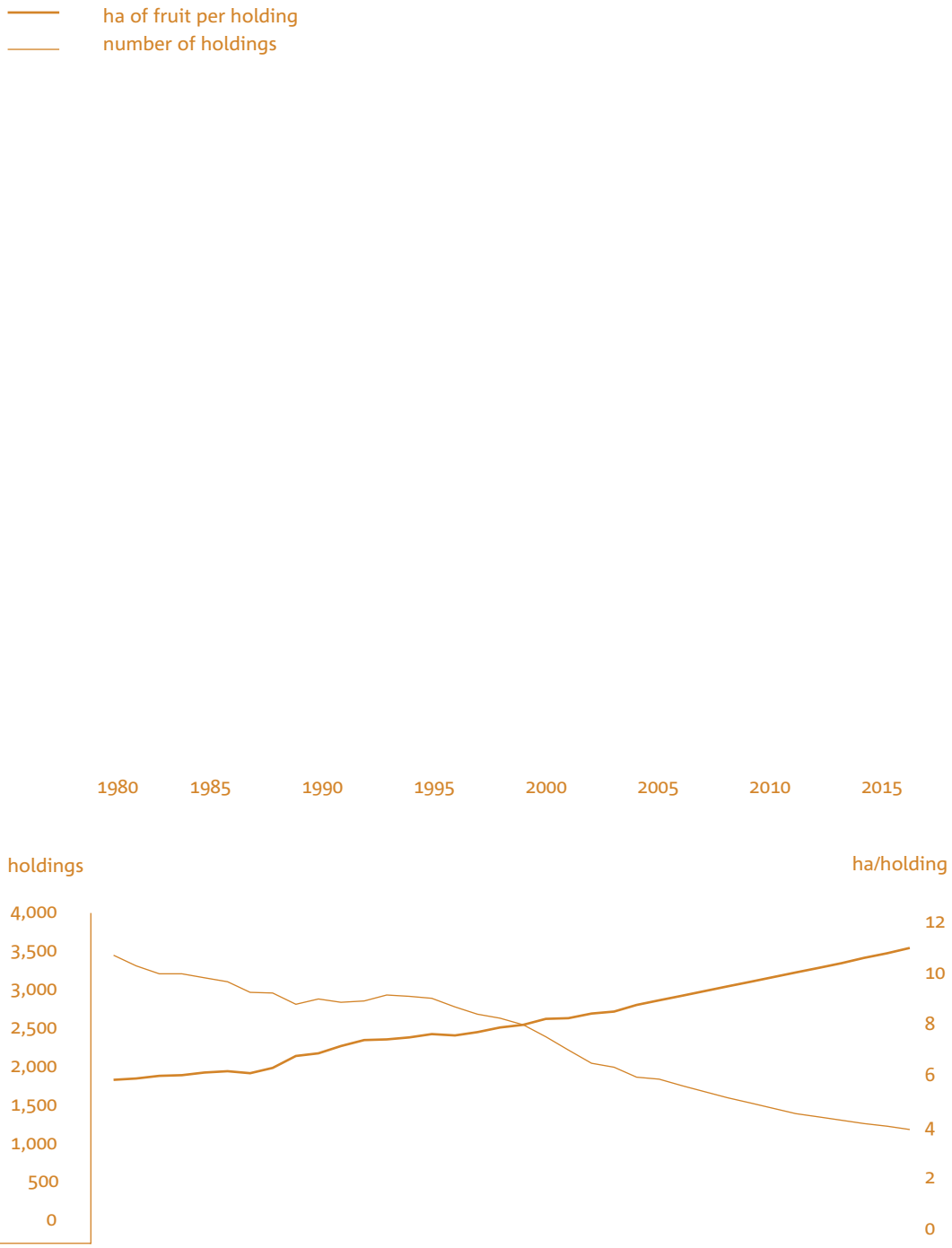


Figure 6.5

Number of specialised fruit holdings and hectares per holding, 1980-2015
Source: Statistics Netherlands (CBS) and LEI.



responding to these needs, and this effect is being felt at the level of the fruit farms. Large batches of high-quality produce require larger farms with a professional management and organisation. During the past few years, mechanisation has been increasing, in particular in the harvesting of fruit (such as the use of conveyor belts). Further mechanisation is being introduced in an endeavour to reduce labour costs. The increases in scale in Dutch fruit cultivation will continue during the coming years (figure 6.5).
In 2004, six new apples varieties were introduced in what is referred to as the 'closed club concept.' These varieties were developed on the basis of flavour testing. This is a closed concept, and the growers are under the collective obligation to sell their produce to the requisite marketing organisations. The promotion of the new brands also takes place on a collective basis. The success of one or two of these varieties could impart an impetus to the development of the apple growers' income. In the longer term, this innovation will have consequences for the size of the farms; growers wishing to plant a new variety will be obliged to purchase a given minimum number of fruit trees if they are to be able to supply crops in quantities of interest to supermarkets. This will act as an incentive to increases in scale. It is still uncertain which of the apple-club varieties will succeed in the market. This could have a great influence on the longer-term development of the farmers' incomes.

Bulbs

The Netherlands serves as the world's bulb breeding ground. Increases in scale are evident in the retail trade, the bulb and bulb flower wholesale trade, and the bulb forcers. The bulb and bulb flower customers will increasingly conduct their business directly with the major service providers. Horizontal and/or vertical collaboration in the chain could result in either the large trading houses or the growers (and growers' associations) assuming this service-provider role. It is expected that these developments in the chain will continue during the coming years.
Professional bulb forcers impose stringent requirements on the quality and product range; in addition, they give preference to year-round cultivation. The bulk segment is marketed via supermarkets and DIY stores, and the exclusive segment via florists and garden centres. The florists' market share is decreasing in comparison with those of the other sales channels.
Net cultivation has rendered efficient cultivation on clay soils a feasible proposition, in particular for tulips. The extensive mechanisation of tulip-bulb peeling has also resolved bottlenecks in the operations. Appropriate logistics, efficient packaging methods and quality assurance are of essential importance to the yield price.
The global demand for bulbs constitutes the most important driving force for the Dutch bulb-cultivation sector. This demand depends on the economic growth in the most important markets. In addition, the exchange rate between the euro and the dollar is a significant factor. A further decline is expected in the number of specialised bulb-cultivation farms.

Tree nursery

Collaboration within the chain and a shortening of the chain are powerful developments in and around the tree nursery farms. The emergence of the DIY markets and the clustering of the retail trade – such as garden centres and supermarkets – are resulting in a segmentation of the market. This compels the primary producers to make explicit choices. These relate to the increases in scale required to play the role of the supplier to the chain, and to specialisation in the crop, cultivation method and sizes.

The necessity for more mechanisation, the delivery of large and uniform lots, the improved utilisation of knowledge, cost-price reduction and higher returns will all result in a further specialisation in terms of types of crop, product range, cultivation phase, and size. Propagation will increasingly shift to specialised companies. The seed treatment in the forest trees and hedging plant sector will increasingly be outsourced to specialised seed-treatment companies. The specialisation in visually-appealing products constitutes an impetus for the further development of the tree nursery sector. Continually increasing opportunities for labour savings are available to the tree nursery sector by virtue of mechanisation and the outsourcing of specific tasks. In spite of the increases in scale and specialisation, the sector continues to offer a broad range of products.

The farms will need to make an explicit decision with respect to the market segment they wish to target, i.e. a broad high-quality segment, or a smaller segment in which the competition is price-oriented. This trend is of particular importance to tree nursery farms cultivating produce for the consumer market. In addition, within this context it is also important to reduce the logistics costs at a sector level.

Both the quality of the cultivation method and the traceability in the chain are becoming increasingly important issues. It is expected that certification and tracking and tracing will become customary elements of the operations within ten years.

The high labour costs and difficulties in finding staff are encouraging investments in mechanisation. However, due to the poor operating results in the past few years the farms often lack the funds required for major investments. Joint investments could be an option that would enable individual farms to achieve cost reductions without needing to fund the entire amount of the investment.

The sector's output is increasing more rapidly than is evident from the increase in acreage, since the majority of this growth is in groups of crops destined for the consumer market that achieve a relatively high production value per hectare. This expansion in production will be focused in specific regions in which land is not scarce and where the spatial planning policy offers scope for tree nursery. The expansion is primarily concentrated in the south-east of the Netherlands. The number of specialised tree nursery holdings is expected to decline more than in the past few years.

INNOVATIVE GREENHOUSE HORTICUL-TURE ENJOYS WORLDWIDE RENOWN

Chapter 7

Greenhouse horticulture complex

7.1 Current position

7.1.1 General

The greenhouse horticulture sector (inclusive of mushrooms) encompasses the cultivation of fruiting vegetables and ornamental plants under glass, the vegetable and fruit processing industry, the supply companies, and the distribution companies. During the years from 1995 to 2003, the added value of the greenhouse horticulture complex increased by 21% to € 4.8 billion. The greenhouse horticulture complex' share in the added value of the entire agricultural complex was 19% in 1995, grew to more than 21% in 2000, and fell back to 20.3% in 2003. In the years between 1995 and 2003, the employment offered by the greenhouse agricultural complex increased by 1.5% to 66,800 alu. During this same period, the employment offered by the complex increased to almost 17% of the employment offered by the entire agricultural complex. Consequently, the greenhouse horticulture complex achieves an added value per man-year that is substantially higher than that of the entire agricultural complex. The income from exports is of greater importance to the greenhouse agricultural complex than to the entire agricultural complex; almost 90% of the income derives from exports. Figure 7.1 presents figures for the imports and exports of a number of product groups.

In 2003, the primary sector accounted for more than two-thirds of the total added value of the greenhouse horticulture complex (figure 7.2). In 2003, cut flowers made the greatest contribution within the primary sector (42%), followed by pot and border plants (27%), greenhouse vegetables (23%), and mushrooms (6%).

The Netherlands is the world's largest exporter of cut flowers and pot plants – and one of the largest importers. The Dutch ornamental plant sector has succeeded in retaining its position in its most important export markets, i.e. Germany, the United Kingdom and France. However, it has lost ground in other countries such as Belgium and Austria, in particular to produce from Israel that is supplied via the Netherlands. The sector's current powerful competitive position is due to the combination of specialised supply companies, trading and logistics, a high level of technological and organisational knowledge, and a favourable geographical location.

The Dutch greenhouse vegetable sector has lost ground in its exports to the European markets. Spain's increasing market share, which grows every year, is to the detriment of suppliers such as the Netherlands. Exports of

Highlights

Current position

International market position strong (fruiting vegetables) to very strong (ornamental plants): switching point

Cut flowers and pot plants are major export products

Supermarkets most important sales channel for vegetables; their significance is increasing for ornamental plants (especially abroad)

Greenhouse horticulture concentrated in the Westland, Oostland, and around Aalsmeer and Venlo

Environmental and labour images are under challenge

The complex is world-famous for its innovative nature

Total of 6,400 greenhouse horticultural holdings and 350 mushroom holdings

Large differences in size of holdings (average of 1.5 hectares glass; some with several dozen hectares) and operating results

Driving forces

Growth in prosperity encourages demand in high-quality vegetables and ornamental products

Supermarkets choose between luxury and price

Liberalisation offers opportunities in new markets; competitive strength in part dependent on the euro

Seals of approval are becoming successful

Crop protection and energy consumption compel changes

Assimilation lighting is confronted with societal criticism

Greenports offer scope for development

Product development and quality improvement

Automation promotes the reduction of labour costs; new greenhouses restrict energy costs

ICT beneficial to the transparency of the chain

Prospects

Further growth of the complex inside and outside the Greenports

More intensive collaboration within the chain (knowledge alliances) required

Mushroom sector confronted with increasing competition from Eastern Europe and China

Innovation in the management of production, sales and distribution (such as quality control/assurance and tracking and tracing)

Modified business structures: management/ entrepreneurship and ownership respectively in different hands

Number of greenhouse horticulture holdings decreasing: average area of glass grows to 2.5 hectares; dominance of large holdings

fresh mushrooms are primarily focused on the European market. This sector is confronted with continually increasing competition from Poland. The number of greenhouse horticulture holdings declined by one-third during the past ten years. In 2004, the Netherlands had a total of about 6,400 greenhouse horticulture holdings, of which 2,050 cultivated greenhouse vegetables, 2,940 cut flowers, and 1,410 pot and border plants. During a ten-year period, the number of mushroom holdings fell by approximately a half to 350. Greenhouse vegetables and pot and border plants both have an approximately 26% share in the production value of all greenhouse cultivation; cut flowers have a share of about 42%, and mushrooms account for the remaining 5%.

During the past 20 years, the greenhouse horticulture complex has shifted from vegetable cultivation towards cut flower and, in particular, pot plant cultivation (figure 7.3). During this same period, there were substantial increases in scale. Holdings with more than 3 hectares of glass now account for a third of the total area of glass. The top five holdings, which account for about 4% of the total acreage of greenhouse vegetables, have an average of 34 hectares of glass (table 7.1). The top ten (0.5% of all greenhouse vegetable holdings) account for almost 10% of the total acreage, and have an average of 28 hectares of glass. The largest holding has 51 hectares of glass. Consequently, the average acreage of glass for all holdings is 'just' 1.5 hectares. Large-scale cultivation operations are less advanced in the ornamental plant sector, in which the top five have an average area of glass of 24 hectares and the top ten about 18 hectares. It should be noted that in practice the labour requirements amount to between four and five alu per hectare of glass. Consequently, the largest greenhouse horticulture holding offers in excess of 200 alu employment.

The greenhouse horticulture incomes are relatively high; during the past three years, the average family income for greenhouse horticulture holdings was considerably higher than the average for all agricultural and horticultural holdings. However, it should be noted that the incomes exhibit a considerable fluctuation over the years, and that there are substantial differences between the various holdings (figure 7.4). The incomes are appreciably lower in the mushroom cultivation sector, in which the increased competition and stagnating demand have resulted in a decline in the operating results since 2001.

During the past two decades, the greenhouse horticulture complex has succeeded in almost halving the energy consumption per unit product. The complex' attention is currently focused on the achievement of the CO_2 targets. The greenhouse horticulture holdings are responsible for some 85% of the agricultural sector's CO_2 emissions. Pursuant to the Kyoto Protocol, the agricultural and horticultural industry will need to reduce the emissions by 10% in comparison with 2000. This could cause problems for the greenhouse horticulture sector due to issues such as the increased use of energy-consuming processes of the nature of CO_2 dosing and assimilation lighting. The use of assimilation lighting, in particular, has expanded enormously;

Figure 7.1

Dutch imports and exports of a number of horticulture under glass products, average value of the years 2003 and 2004
Source: Statistics Netherlands (CBS), processed by LEI.

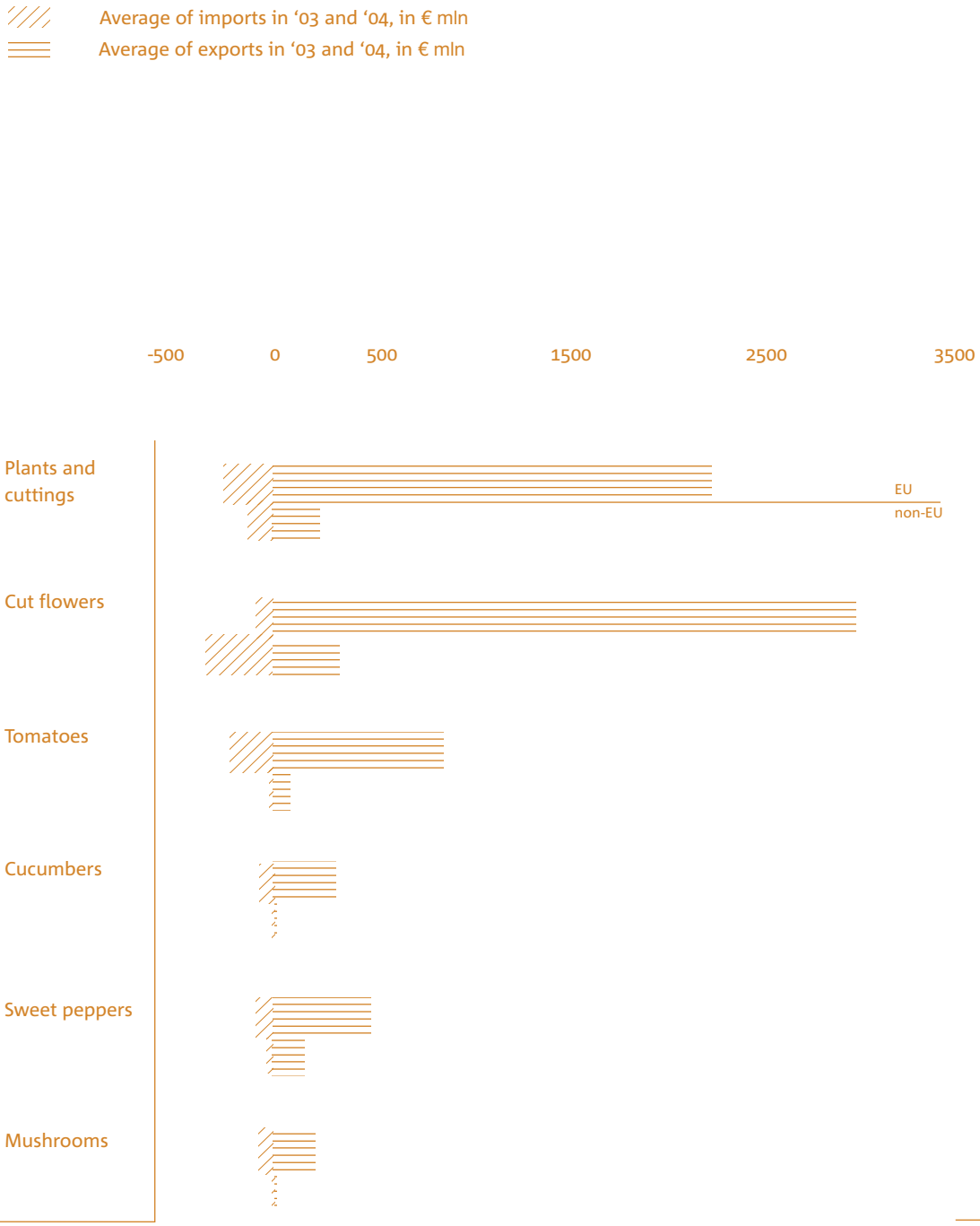


Figure 7.2

Breakdown (in %) of the added value and employment in the total horticulture under glass complex, 1995 to 2003. Source: LEI.

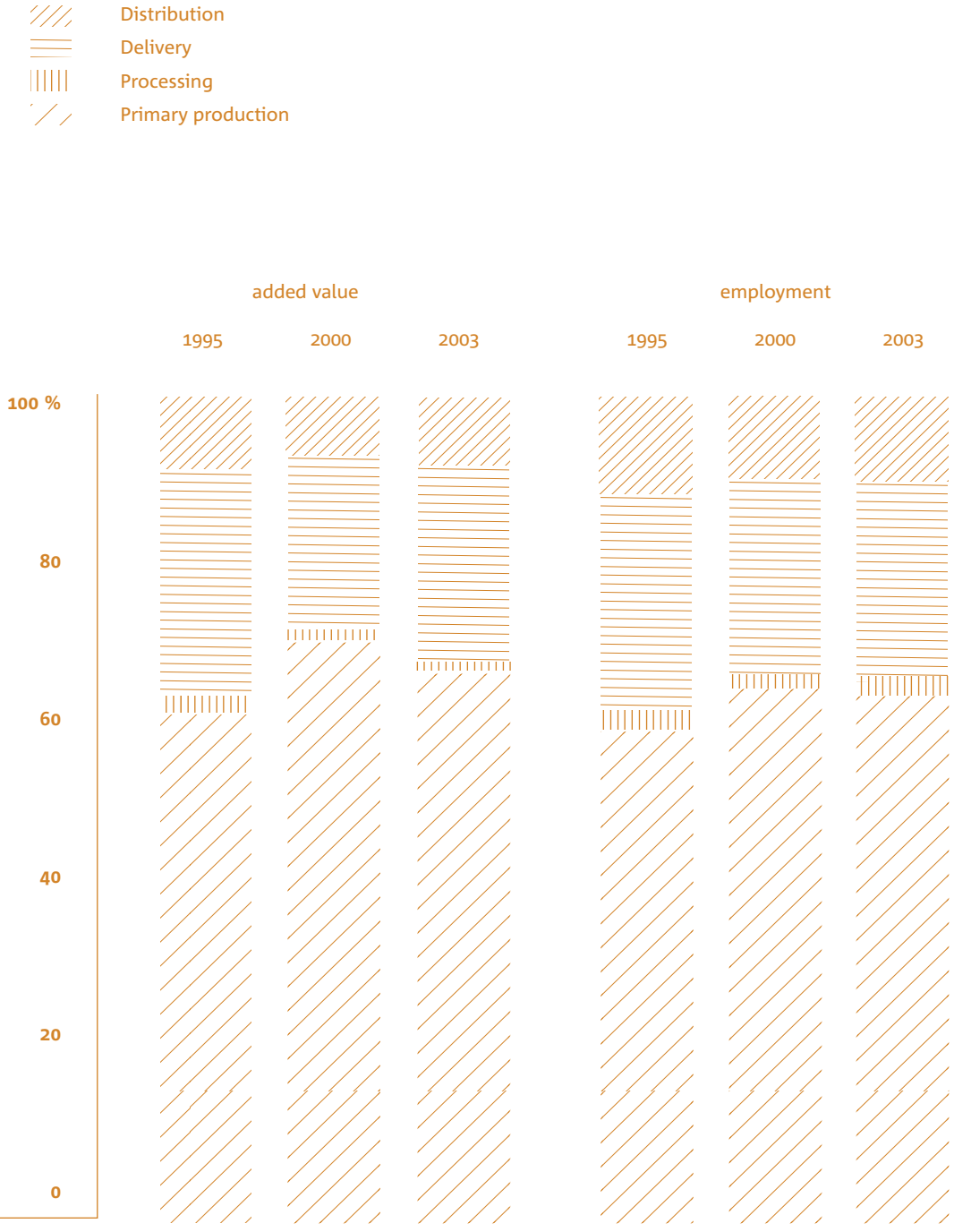


Table 7.1

The top holdings and the total of the Dutch glasshouse horticulture, 2003

	Vegetable holdings	Floricultural holdings
Acreage, top five holdings (hectares)	170	120
Acreage, top ten holdings (hectares)	278	181
Total number of holdings with vegetable or flowers and plant greenhouse cultivation	2,825	5,597
Total acreage (hectares)	4,320	5,769

Source: Penning, 2003; CBS, *Landbouwtelling* (agricultural census) 2004.

since 1995, the illuminated greenhouse area has more than doubled and, moreover, the intensity and duration of the assimilation lighting have both increased. The use of assimilation lighting is encountering increasing societal resistance.

7.1.2 Flowers and plants

The flower auctions have traditionally played an important role in the marketing of cut flowers and pot plants. The Netherlands is the world trade centre for cut flowers, and the country plays an international leading role. Some of the produce from Europe and Africa is also supplied to the Dutch auctions, as is a limited amount of the produce from South America. 25% of the produce supplied to the auctions comes from abroad. The majority of the flowers are destined for Europe; some produce is also exported to other continents. The concentration of the trade at the Dutch auctions would appear to imply large-scale operations. However, the auctions accommodate a large number of traders that make purchases for their own customers. The flower auctions do not serve primarily as a marketplace that enables the players to purchase batches of sufficient size, but rather as a means of dividing relatively large lots into smaller batches and providing for a large variety for many traders. It is expected that this situation will remain unchanged in the coming decade, whereby the importance of the auction clocks will diminish to the benefit of mediation.
The small florists form an important sales channel for the ornamental-plant sector. Relatively small-scale wholesalers are required to serve the many small florists. However, the share of the chain stores, garden centres and

Figure 7.3

Cultivated area by specialised horticulture under glass sectors and number of holdings, 1980-2004

Source: Statistics Netherlands (CBS).

DIY stores in the sales of ornamental plants are increasing, a development which gives cause to the need for a further increase in the scale of the trading houses.

7.1.3 Vegetables

The Dutch greenhouse vegetable sector is strongly focused on exports, and has traditionally always endeavoured to minimise the cost price. In the aftermath of the *Wasserbombe* crisis of the beginning of the 1990s ('water bombs': tomatoes with virtually no flavour), the sector changed its course, and is now focused on the supply of high-quality products. This has resulted in the introduction of the Tasty Tom tomato brand, for example. Some ten years ago, the Netherlands was forced to relinquish its position as the largest exporter of vegetables to Spain and Mexico. However, Spain's image has recently been damaged by the presence of excessive pesticide traces on its produce. One of the Dutch sector's strengths is the use of biological agents to control crop diseases. From a global perspective, the Netherlands is a minor producer of tomatoes, sweet peppers and cucumbers. Turkey, Egypt and Spain are much larger producers.
During the past decade, a concentration process based on mergers, take-overs and participating interests has taken place in the trading links of the vegetable chain. An example *par excellence* is the merger of nine vegetable and fruit auctions and the *Centraal Bureau van de Tuinbouwveilingen* to form The Greenery. This was followed by the merger with a number of trading houses in 1998. These mergers were prompted by the need to respond to the increases in scale in the retail trade. Although The Greenery is the most important player in the Dutch vegetable trade, from a European perspective it is only a minor player with a market share of far below 5%. The Dutch wholesalers will nevertheless need to incorporate some of the local products into their product range if they are to be able to serve the international supermarket chains. Pursuant to this need, The Greenery now has such a partner, Humber Growers, in the United Kingdom. In addition, for logistics reasons, The Greenery also has sub-branches in Belgium, Germany, Italy, and Spain.

7.1.4 Mushrooms

Exports of fresh mushrooms are primarily focused on the European market. However, the Netherlands is confronted with increasing competition from Poland. Exports of processed products are concentrated largely on Germany, France, and the USA. France and in particular China are increasing the competition in the European market. The Netherlands is losing market share in the USA due to the greatly increasing supplies from China.
The number of mushroom holdings has more than halved since 1990. In 2004, about 350 holdings cultivated mushrooms (table 7.2). The top five holdings in the mushroom cultivation sector supply about 20% of the produce for the fresh mushroom market. The top five holdings produce

Figure 7.4

Differences in family income from horticulture under glass holdings by size category, average 2001-2003
Source: LEI.

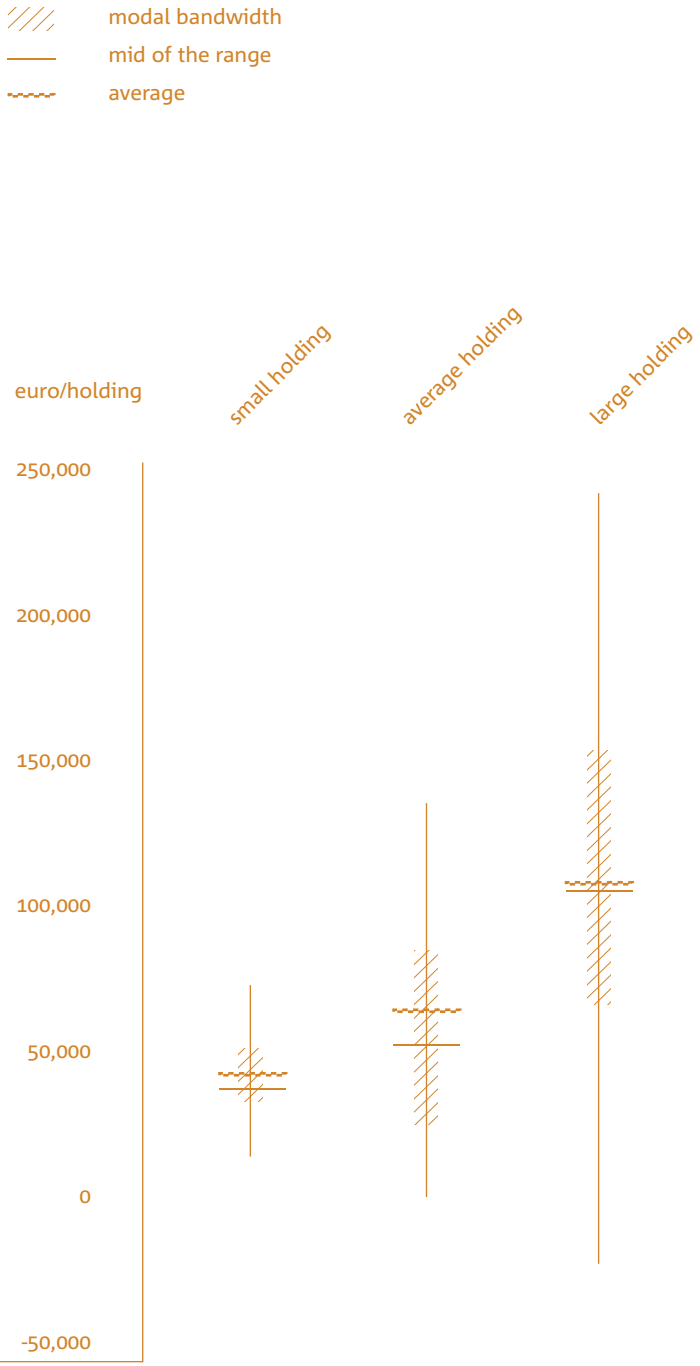


Table 7.2

Developments in the Dutch cultivation of mushrooms, 1990-2004

	1990	1995	2000	2003	2004
Number of mushroom holdings	790	670	520	400	350
Acreage for mushroom cultivation (hectares)	105	109	95	90	85
incl. full grown compost (%)	27	75	95	98	98
Cultivation area (m^2) per holding	1,329	1,625	1,827	2,255	2,417

Source: CBS *Landbouwtelling* (agricultural census).

more than 30% of the mushrooms for industry. The top ten holdings, still about 3% of the total number, account for some 25% of the production. The Dutch preserves market is served by two players: Lutèce (CNC) and ProChamp (a private holding). These are in fact chain organisations, extending from the raw material production to trade with the retailing sector. The Dutch preserves industry is under a great deal of pressure, and the industry will need to develop new product and marketing concepts if it is to retain its position in its export markets.
The fresh mushroom market is served by a few major and a large number of minor producers. The major producers have direct contacts with the retail sector. The smaller producers, who are still engaged in fragmented operations, supply their produce to the auctions and a number of major marketing organisations.

7.2 Driving forces

7.2.1 Market, CAP and WTO

On balance, there will be little growth in the population of the most important European markets for Dutch greenhouse horticulture products. Consequently, the increase in demand will depend on the growth of the per capita income. It is expected that this growth will amount to approximately 2% per annum. During the coming decade, the demand for luxury horticultural produce and pre-processed products will increase, with the primary focus on health, convenience, and experience.
The ornamental plant and greenhouse vegetable sectors both enjoy powerful export positions, although the position of the latter is under pressure due to increasing competition. The expansion of the EU offers opportunities for

exports of greenhouse vegetables, although this will also result in more competition. The export opportunities depend greatly on purchasing-power development in the new member states, since Dutch products are luxury products. The flower and plant sector is in an excellent position for increased exports; however, the Dutch greenhouse vegetable sector has a less favourable position. The Eastern European greenhouse horticulture operations are not expected to pose a major threat for the time being. The challenges confronting the Dutch greenhouse horticulture complex are to make maximum use of the export opportunities, and to enhance the control role in the new member states.
The EU will remain the most important market for greenhouse vegetables. Sales to distant countries (USA, Japan, Russia) will increase slightly, and will encounter fierce competition from countries in the regions. Exports to the new EU member states will remain relatively limited. The supermarkets are by far the most important sales channel, and will be served by a number of major food providers. This will ensure for control of the costs, and will guarantee the freshness and cultivation methods. Sales of pre-processed vegetables will increase, the majority of which are marketed via the retail trade. Other growth markets are ready-to-cook meals and the away-from-home market. The majority of the sales of flowers and plants will also continue to be focused on the EU. Sales to countries outside the EU will increase by an amount depending in part on the exchange rate of the euro.

Quality
The food quality and safety and requirements imposed by the market and society constitute a major driving force. A license to produce and to deliver is of essential importance to the sector. The Netherlands currently enjoys a lead by virtue of the quality guarantees (Eurep-GAP), HACCP and ISO certification; however, in the longer term these will become standard requirements and will no longer constitute a unique selling point. In addition, tracking and tracing (supported by ICT) will be required by producers wishing to remain a preferred supplier. It is important that the sector conveys the efforts it is making, and the results it has achieved.

Mushrooms
The demand for mushroom preserves is decreasing, whilst at the same time there is a trend towards a need for ease and convenience, particularly amongst young people. The fresh mushroom market (with a tendency towards processed mushrooms) is increasing (fast food and convenience); to a limited extent, the same is also applicable to the deep-freeze mushroom market. The demand for other edible fungi in the Netherlands and elsewhere is increasing, to the detriment of white mushrooms, although the market share is still limited. The United Kingdom wants an in-depth product range (in terms of size categories, processing, and packaging) whilst France and Germany have the need for a wider variety of edible fungi. This offers a basis for product development.

European policy
The greenhouse horticulture complex is experiencing virtually no effects of the amendments to the CAP. Nor does the CAP have any significant effect on the mushroom sector, which has always been an unregulated market. However, import quotas do protect the European mushroom market from Chinese preserved products. The rapid phasing out of this quota within a short period of time (for example, by the accelerated phasing out of tariff escalation) would, depending on the exchange rates, have an extremely detrimental effect on the European preserves industry. In addition, this would also have an indirect effect on the growers of fresh produce.

7.2.2 Environment

Crop protection and energy are the most important issues requiring attention with respect to the greenhouse horticulture environmental policy as laid down in the *Besluit Glastuinbouw* ('Greenhouse Horticulture Decree,' 2002). The EU has recently decided to harmonise the Community's active ingredient policy; the Netherlands is no longer in an exceptional position.

Crop protection
The cut flower soil cultivation sector still uses relatively large quantities of crop protection agents. A further increase in substrate cultivation and the use of biological control agents are expected in the sector. Since the requirements laid down in Dutch legislation (the authorisation of pesticides) are already more stringent than the European legislation, the more stringent regulations in the new European legislation will have virtually no effects on the greenhouse horticulture complex. It is possible that more attention will be given to the restriction of residues within the scope of food safety (2nd pillar in the sustainable crop-protection policy). A slight increase in the administrative burden may occur following the introduction of the new Integrated Crop Protection Order in Council (2005). All in all, a limited increase in costs is possible.

Energy
The effect of the higher energy (gas) prices following the recent increases in oil prices will be of importance to the greenhouse horticulture holdings' operating results. Depending on the crop under cultivation, energy costs account for between 10 to 20% of the total costs incurred by greenhouse horticulture holdings. The current high prices may (in part) be of a structural nature. If so, this will serve as a major incentive for improvements in holding operations focused on a more efficient use of energy.
The sector's energy efficiency target for 2010 will not be achieved. This is largely due to the decreased proportion of third-party heat following the liberalisation of the energy market and the increased use of energy-consuming processes (assimilation lighting). In addition, this liberalisation has unfavourable consequences for energy-extensive holdings. The sectorial agreements have been interpreted in terms of energy standards by crop

(Order in Council): however, the Dutch Organisation for Agriculture and Horticulture and the Horticulture Marketing Board are now advocating the CO_2 target figure agreed with the Ministry of Housing, Spatial Planning and the Environment in 2004 (6.5 million tonnes in 2010 for the current acreage; a maximum of 7.1 million tonnes in the event of an increased acreage). There is uncertainty as to how the greenhouse horticulture complex should approach the CO_2 target figure: will the complex need to participate collectively in trade in CO_2 emissions from 2008 and/or develop CO_2 limits at holding level? This would discourage the in-house generation of combined heat and power and sales of heat and power to third parties. However, the trade in CO_2 emissions would offer scope for (energy) intensive greenhouse horticulture holdings since they would be able to purchase CO_2 emission rights.
Although the complex is making investments in new developments such as the *Gesloten Kas* ('closed greenhouse') and the 'energy-supplying greenhouse', it is not expected that these facilities will have been implemented on more than a limited scale in the years up to 2015. The lack of transparency in the energy market acts as an impediment. The development of assimilation lighting will continue at an accelerated pace, and will be driven by the market.

Fertiliser policy
The greenhouse horticulture complex uses what are, in principle, closed systems for the supply of nutrients that can readily be controlled. To date, no limits have been imposed pursuant to the manure policy; however, this is certain to change. The EU also stipulates the specification of limits in this area. These will probably result in more stringent requirements.

Mushrooms
Although the environmental policy continues to act as a driving force in the sector's developments, its importance has nevertheless decreased. The most important environmental problems, such as ammonia emissions (with cultivation on substrates) and waste water have largely been resolved following the implementation of suitable measures. The Netherlands is ahead of its competitors in crop protection issues (a covenant has been concluded with the authorities). The Multi-Annual Energy Agreement expires in 2005. Although the energy-efficiency target will be achieved, the sector will fall far short of the sustainable-energy target. Energy will continue to act as an incentive for innovations during the coming years. The CO_2 emission agreements will not be of relevance to the edible fungi sector. Since the horse and chicken manure used by the sector fall within the scope of the Manure Act, the sector's mushroom compost must be disposed of as animal manure. This results in additional costs.
The EU Water Framework Directive may be of importance to the storage of heat and cold in the soil. Groundwater extraction will be less feasible in the future.

7.2.3 Space

The greenhouse horticulture complex has traditionally been located in the west of the Netherlands and the region around Venlo due to the favourable climate, the location of centres of population, and the proximity of logistical nodes (figure 7.5). The development of the Port of Rotterdam, the emergence of the trading cluster around Amsterdam Schiphol Airport and the complex' autonomous development into a group supplying high-quality products have all resulted in the evolution of the greenhouse horticulture complex into a world-class cluster able to supply large daily quantities of fresh produce sourced from all over the world to its (primarily) European customers.
Over the years, the food horticulture sector has developed into a complex comprised of high-quality production areas, innovative supply companies, and a turntable for the international trade in and distribution of fresh produce. The major concentration regions for the greenhouse vegetable sector are located in the Westland, the Bleiswijk-Bergschenhoek-Berkel en Rodenrijs triangle (the 'Oostland'), and the region around Venlo.
A comparable spatial concentration has developed in the flowers and plant sector, although in this instance the two major concentration regions are located in Aalsmeer and environs and the Westland. The two Aalsmeer and Naaldwijk logistical centres both need to have supplies of high-quality produce within their neighbourhood. Major secondary production areas are located in north Limburg, in the vicinity of Arnhem, in the neighbourhood of Emmen, and in North Brabant. The non-primary sector – such as the service providers and supply companies, processing industry, auctions and wholesalers – are concentrated in the same areas. Few service providers are located in the ornamental plant sector's secondary production areas. New cultivation areas in the north and east of the country, such as Emmen, Berlikum, IJsselmuiden and the Noordoostpolder remain dependent on the logistics facilities in the west.
As such, the greenhouse horticulture complex is the only agricultural segment that can to any extent compete with an urban destination in terms of land prices; however, this is not the decisive factor. Expansion of greenhouse horticulture requires a modification of the zoning plans, a modification that depends on the regional spatial planning policies. Municipalities in the Randstad conurbation with an existing housing shortage and experiencing difficulties in finding expansion areas for new housing will be less inclined to permit expansions of greenhouse areas. However, the proximity of auctions and logistics nodes continues to be of great importance to this sector. Increasing mobility will result in even more severe congestion in and around the Randstad conurbation, in particular of the logistics axes and nodes. From this perspective, the relocation of the greenhouse horticulture complex to Zeeland and west Brabant will become more appealing.

Figure 7.5

Horticulture under glass regions (based on DSU/ha; the darker, the more DSU/ha)
Source: Alterra.
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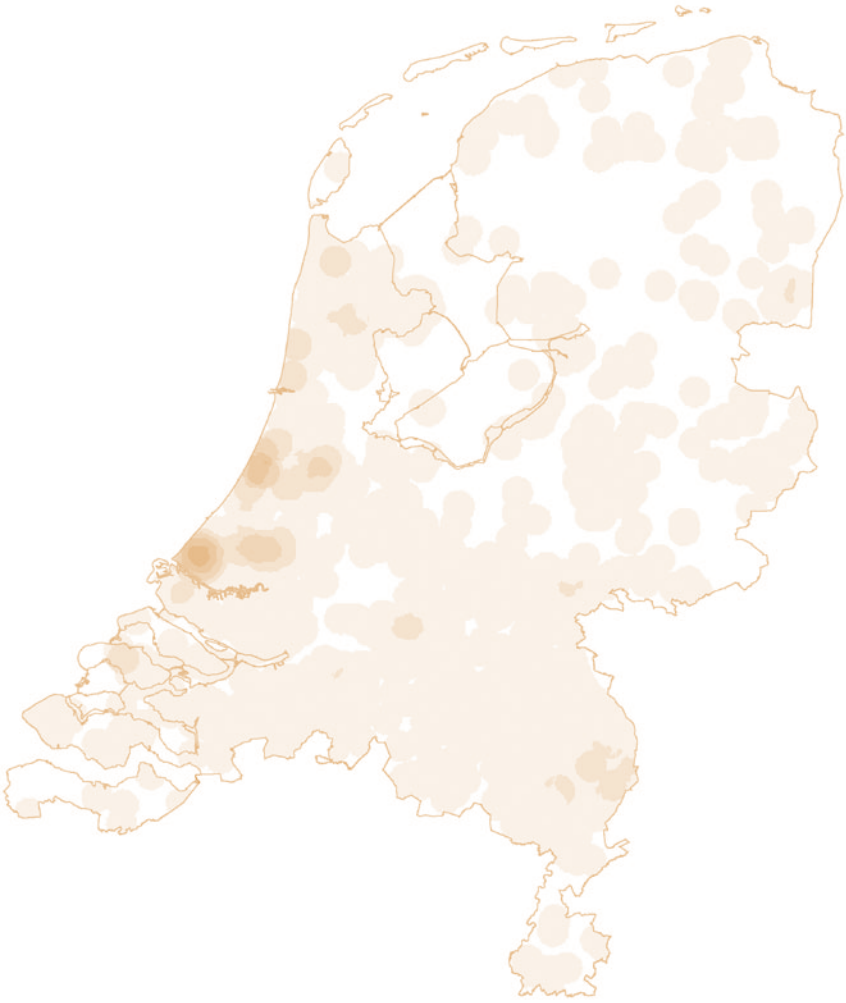


Greenports

The designation of the Greenports Westland/Oostland, Aalsmeer and environs and Venlo in the Spatial Policy Document (*Nota Ruimte*) acknowledges the economic importance of the greenhouse horticulture complex, and will offer the complex scope for the development of the operations required to retain and reinforce its position. In addition, the government also intends to designate agricultural development regions for the development of non-soil based and capital-intensive agriculture, such as greenhouse horticulture. These include the ten greenhouse horticulture locations in the *Bestuurlijke Afsprakenkader* ('Administrative Framework Agreement,' the Zuidplaspolder, Berlikum, Emmen, Grootslag, Californië/Siberië, Luttelgeest, Bergerden, IJsselmuiden, Moerdijkse Hoek, and Terneuzen).

The urban location of the greenhouse horticulture Greenports gives cause to the need for efficient use of the space and societal acceptance of the Greenports (compatibility with the surroundings). The two Greenports in the west of the Netherlands are in a favourable location with respect to the climate (light and temperature) and their proximity to Amsterdam Schiphol Airport and the Port of Rotterdam.

The future multiple use of land and combination of functions will result in changes in the appearance and the operations of greenhouse horticulture holdings. In addition, the 'Greenport concept' will result in more intensive interaction and mutual interdependency between the various parties in the cluster. The Greenports play an important marketing and supply role for the other greenhouse horticulture locations in the Netherlands. Although direct deliveries of produce ex-company to the customers will increase, the Greenports will nevertheless continue to play an important collection and assembly role.

The increasing congestion on the roads is exacerbating the problems in transporting produce. These problems are more severe in the Netherlands than in other EU countries. It will be necessary to examine alternative transport options, such as high-speed trains, although this option would appear to be more suitable for the longer distances in the EU (transport to Italy and Eastern Europe).

Mushrooms

The spatial planning policy has little effect on the location of these holdings, since they occupy little land. Although the production could also be located on industrial estates, the sector does not wish to move to these areas. The development of the *Nieuw Gemengd Bedrijf* (New Mixed Holding) – a physical link between various sectors – is still in its infancy, and will at most remain modest in scope in the years until 2015.

7.2.4 Technology

The greenhouse horticulture complex is a capital-intensive and strongly technology-driven complex. Consequently, the complex benefits from general technological developments, such as ICT, and from specific technological

applications developed for its operations. A number of themes are:
- robotisation to reduce labour requirements and transport needs within the holdings;
- multiple use of space (greenhouses on offices, multi-layer greenhouses, floating greenhouses);
- overseas transport (intelligent containers);
- cultivation optimisation for example by means of sensors and control systems targeting environmental protection and energy conservation;
- more robust crops, other colours and sizes, improved quality, response to the demand for diversity.

The market dictates the implementation of technological developments, and compels holdings to introduce continuous modifications and efficiency improvements that are often based on new technologies, such as biotechnology and robotisation. New technologies demand increasingly greater investments, thereby acting as an incentive to increases in scale. In addition to product and process innovations, innovations are also being introduced in the management of the holdings and their sales and distribution (such as quality control and assurance, and tracking and tracing).

Mushrooms
Production, technological and operational innovations are essential if the production costs per unit product (in particular, the labour costs) are to be reduced. Picking robots for the fresh-mushroom market could be introduced within the near future. Growers will need to improve their control of the cultivation, and they will need to be able to make use of growth models. In addition, it will also be necessary to reduce the variation in the raw materials (compost and covering soil). Technological innovation alone will not be sufficient in the future. Co-innovations and system innovations will also be necessary to improve the cost-yield ratios. This will in turn require interaction between the various players in the innovation system, and certainly when a number of links in the chain are involved. These endeavours will not necessarily be successful, as demonstrated by the bankruptcy of the last fresh mushroom crate manufacturer. Product innovations focused on new varieties are accompanied by many risks, and the breeding programmes are lengthy and expensive.

7.3 Prospects

7.3.1 General

Pursuant to the reference scenario, the greenhouse horticulture complex will exhibit substantial economic growth, and will increase its share of the total agricultural complex in the years up to 2015 (table 7.3). Employment offered by the complex will remain virtually unchanged (-5%). Within the greenhouse horticulture sector, sales of ornamental products in particular will increase; sales of greenhouse vegetables will also expand. Exports of the major products will continue to grow in the coming years. Substantial

Table 7.3

Breakdown of the added value and employment (alu) by sector in the greenhouse horticulture complex, 2003 and 2015

	Added value				Employment			
	2003 € million	%	2015 € million	%	2003 alu	%	2015 alu	%
Greenhouse horticulture, total	3,237	67	4,125	71	43,039	64	40,477	64
incl.: greenhouse vegetables	456		507		11,484		10,598	
cut flowers	1,553		2,081		19,808		18,840	
pot plants	861		1,155		10,306		9,798	
mushrooms	368		382		1,441		1,240	
Processing	50	1	66	1	588	1	539	1
Delivery, total	1,168	24	1,315	22	16,710	25	16,380	26
incl.: agricultural services	28		32		1,089		1,126	
gas, electricity, water	119		130		719		793	
wholesale	131		148		3,796		3,894	
banks, insurance	221		250		5,070		5,202	
Distribution	358	7	408	7	6,515	10	6,707	11
Total, greenhouse horticulture complex	4,799	100	5,848	100	66,827	100	63,565	100
In % of total agro-complex	20.3		21.7		16.8		18.2	
Export dependency (%)	88		90		88		87	

Source: LEI.

Table 7.4

Supermarkets' market share (%) in consumer expenditure

Country	Cut flowers	Vegetables
Netherlands	25	85
United Kingdom	64	90
Germany	14	90
Denmark	46	90
France	15	70

Source: Penning, 2003.

increases are expected in cut flower and pot plant exports; in addition, clear increases are also expected in exports of tomatoes and sweet peppers. The complex' dependency will increase even further to 90%. Consequently, the complex is highly dependent on foreign consumers.
The greenhouse horticulture complex will continue to be called to account for its corporate social responsibility. It will continually need to justify its license to produce and to deliver (transparent, safe, reliable, and healthy) by means such as the use of labels (MPS-Qualified, HACCP, etc.) and tracking and tracing. The complex will need to assume its responsibilities if it is to be able to increase societal support and, consequently, its opportunities for further development. Technological developments in a range of areas will contribute to these objectives, such as new energy concepts, light shields, and new greenhouse designs. In addition, people as employees will also be an important subject. The *Transitiecollege* ('Transition Council'), comprised of members from three ministries, is collaborating with the agricultural sector in the support and promotion of this process.
The complex can only increase consumer confidence by resolving the problems with respect to improvements and innovation, shortage of space and knowledge circulation. However, the complex' innovative capacity is limited by its financial resources and holding investment cycles. It is expected that the greenhouse horticulture complex will be able to respond sufficiently to the needs of the general public and the consumers. New forms of knowledge circulation, such as entrepreneurs' networks, will play an important role in ensuring this response. In addition, the complex shall need to communicate its efforts to its surroundings.
Funding these innovations is becoming increasingly impossible for individual holdings. There is insufficient risk capital to support entrepreneurs with new initiatives. The *Tuinbouwcluster Technologiefonds* ('Horticulture Cluster Technology Fund') that was set up recently will impart an impetus to these innovations; however, the funds are limited.
Increases in scale and increasing innovations will result in the emergence of modified business structures with management/entrepreneurship and ownership respectively in different hands.

Increases in scale of the marketing organisation
The combination and concentration of trading houses will result in the emergence of a number of food providers in the greenhouse vegetable sector. These will conduct business directly with the supermarket chains which, in analogy with the situation in other EU member states, are responsible for the majority of vegetable sales to consumers (table 7.4). The food providers will ensure for their ability to supply large quantities throughout the year by sourcing much of the produce from national and international growers' associations. This will in turn impose greater pressure on growers to increase their scale and enter into more intensive collaboration with their colleagues. The growers' associations will increasingly introduce joint facilities for packaging large lots and making them

Figure 7.6

Number of horticulture under glass holdings and area of glass per holding, 1980-2015
Source: Statistics Netherlands (CBS) and LEI.

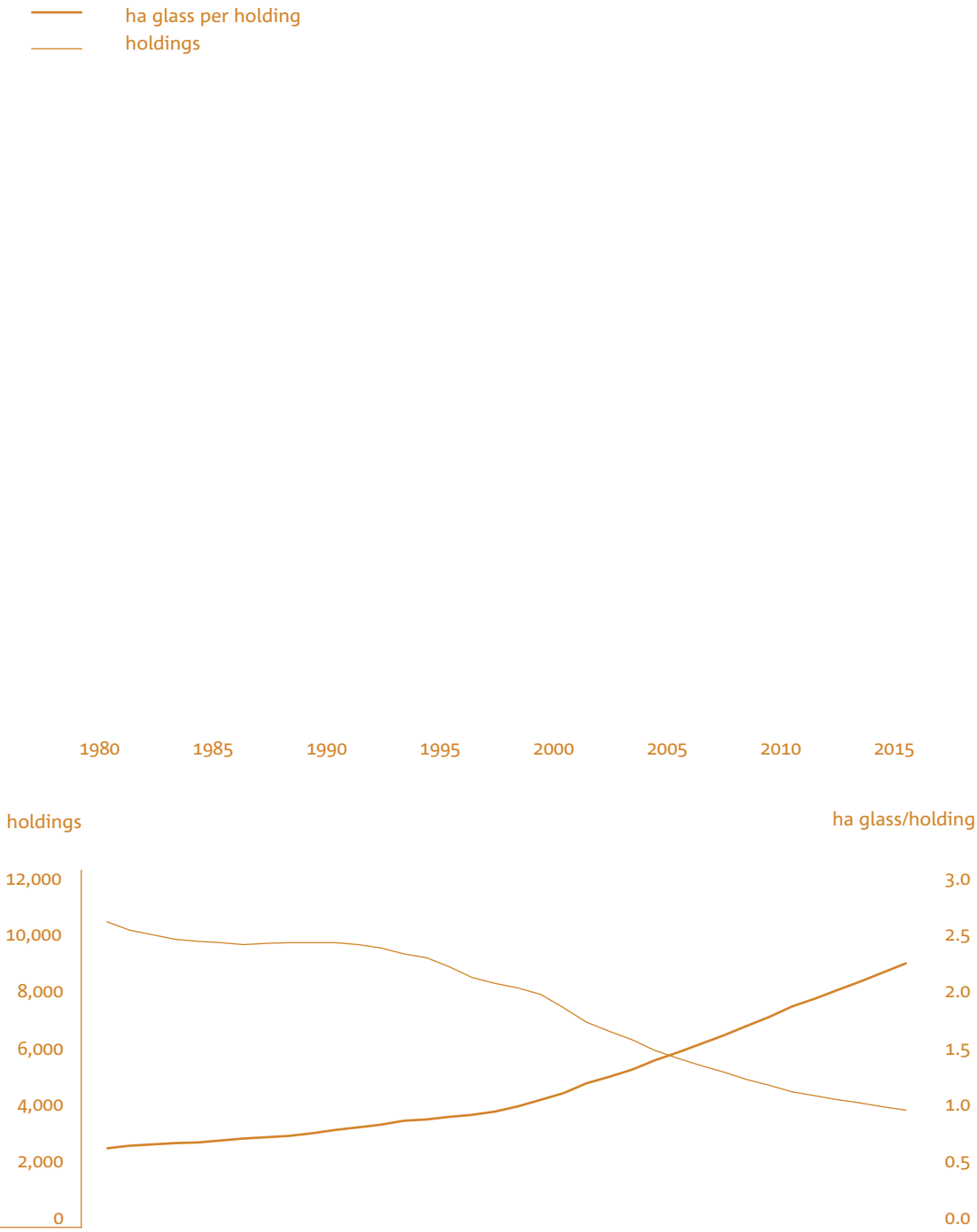
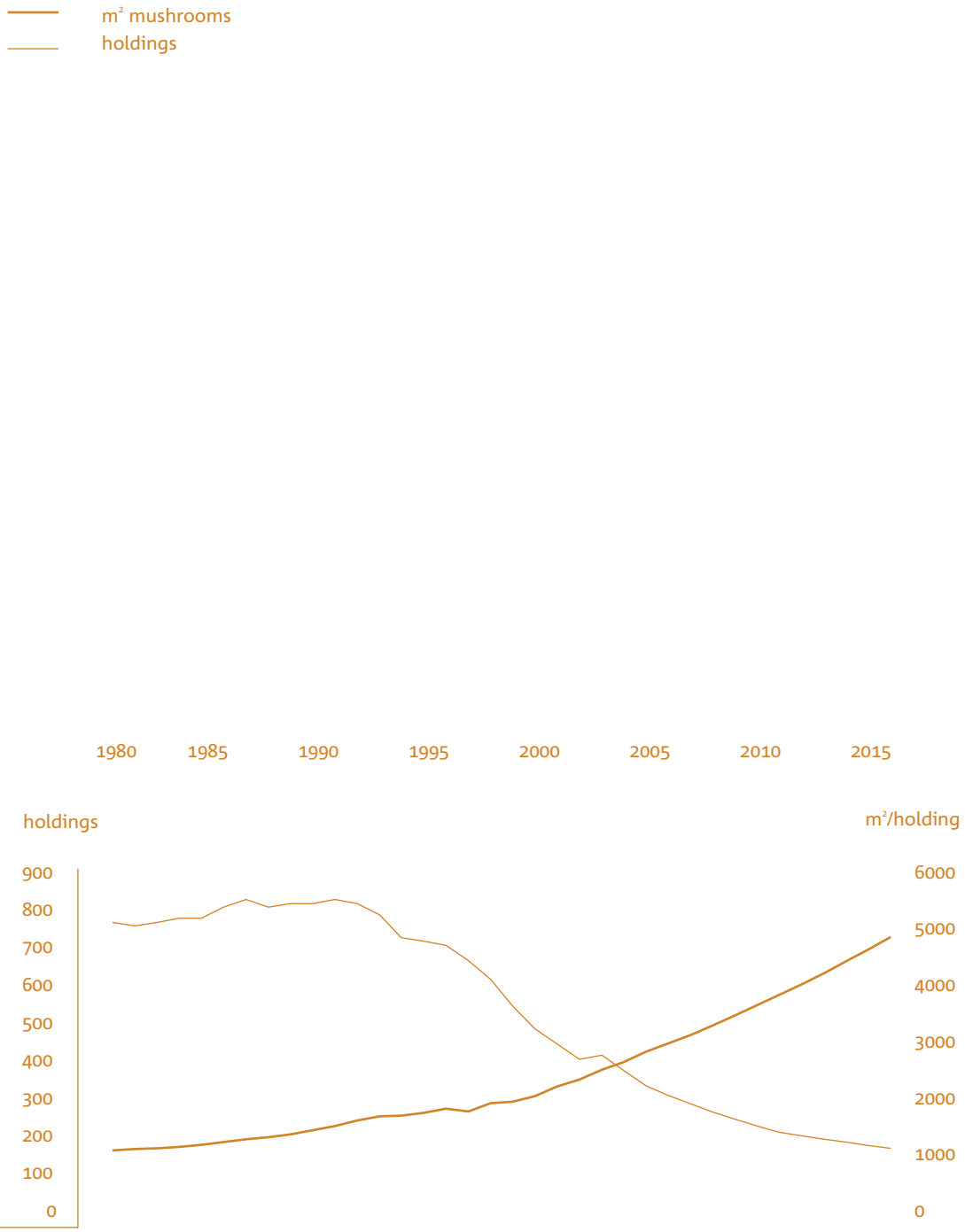


Figure 7.7

Number of mushroom holdings and average cultivation area per holding, 1980-2015
Source: Statistics Netherlands (CBS) and LEI.



ready for transport, a measure designed to retain the food providers' interest in their produce. Growers' associations are constructing large processing halls, and this number will continue to increase. In addition, forms of direct collaboration between growers and the retail trade designed to ensure for the necessary cost control in the chain will become more common. These developments will give cause to the need for certification offering the requisite assurance.
Cut flowers and pot plants are both parts of the ornamental plant cluster, which also extends to tree nursery and bulbs. More intense collaboration between the various trade associations will contribute to a strategic orientation towards the developments in the cluster and its markets. Staying in the lead requires a great deal of effort if the pack is to be kept at a distance.
The Netherlands will continue to serve as the cut flower world trade centre, whereby substantial and increasing supplies will be sourced from abroad. The auctions will continue to play an important role in marketing cut flowers and pot plants, whereby the use of mediation will increase. The auction clocks will continue to determine the price of cut flowers, and the auctions will retain their important role in the regrouping and assembly of produce (such as bouquets). Foreign growers are also expected to become members of the Dutch auctions, a move designed to ensure that the Netherlands retains control. In the future, international chain stores, garden centres and DIY stores will play an increased role in marketing the produce. This will in turn result in increases in scale in the trading link.

7.3.2 Holdings

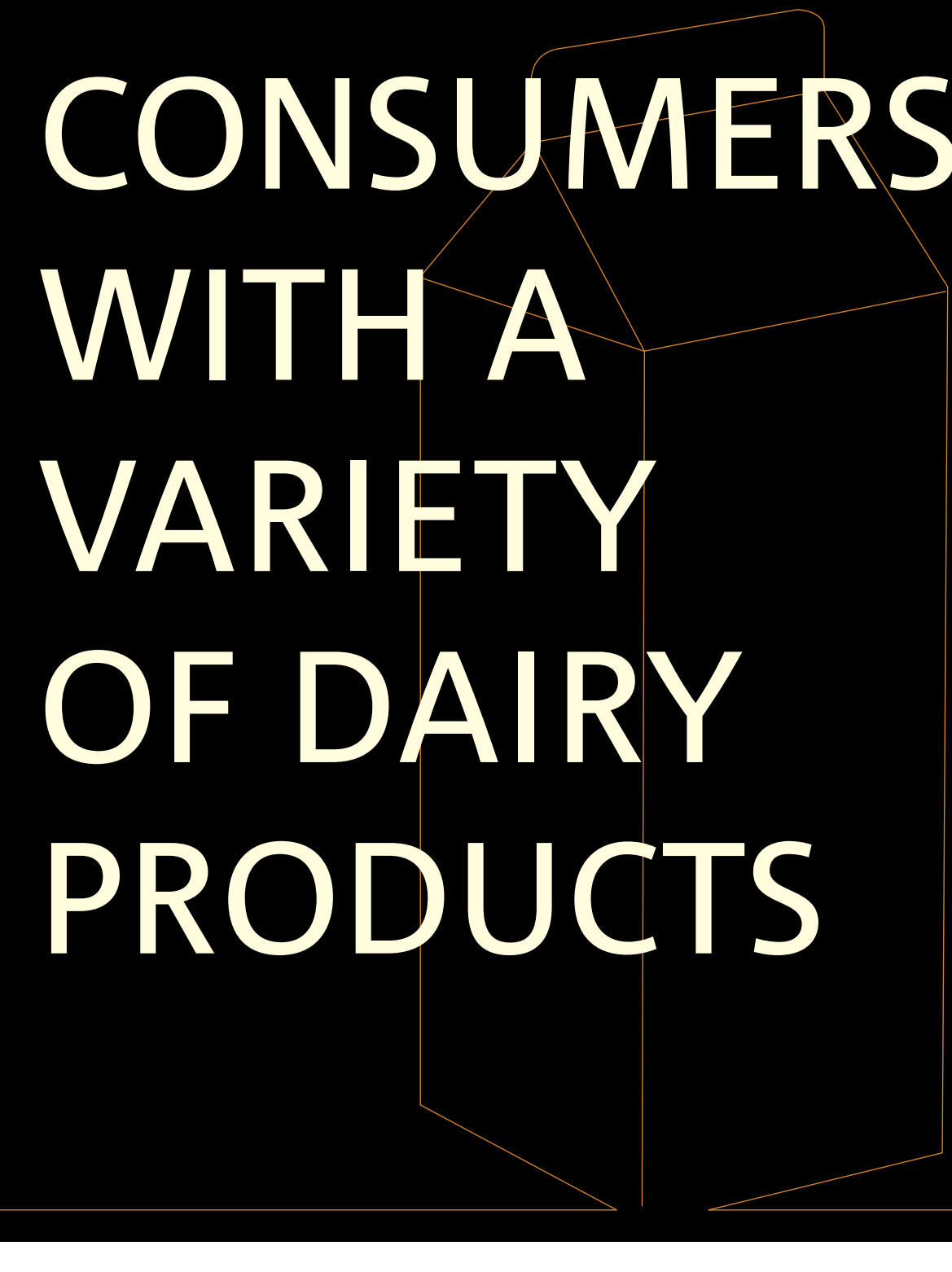
The market's demand for high-quality produce cultivated in a transparent manner will continue to increase. This, in combination with the increasing segregation of physical flows and information flows, will give cause to the need for more intensive collaboration within the chain. Innovations will increasingly be realised by a number of links in the chain or by a number of sectors (such as knowledge alliances). These 'system innovations' are necessary for a rapid response to changing requirements imposed by the market, and to changing societal needs.
The total acreage of the greenhouse horticultural operations will increase slightly in the years up to 2015. Productivity increases arising from intensification and restructuring will result in the growth of the total production volume. This growth will be made feasible by the increasing demand for the produce. A market strategy will offer the best prospects for the majority of the greenhouse horticulture holdings. However, a cost-price strategy in combination with the market strategy will also offer opportunities for a number of (major) holdings.
Increases in scale of and/or collaboration between the primary holdings will be employed to retain the complex' strong competitive position. The number of specialised greenhouse horticulture holdings is expected to decline from the current 6,000+ to 4,000+ holdings with an average of 2.5

hectares of glass (figure 7.6). However, holding sizes will exhibit major differences. Holdings with more than 3 hectares of greenhouses now account for a third of the total area of glass.

Diversification
The greenhouse horticulture complex is not offered any substantial opportunities for the diversification of the business operations; however, the complex is offered opportunities in the integration of the chain, such as with respect to the processing of its produce. The fierce competition gives cause to the need for a further specialisation of the holdings, a need which is not immediately compatible with diversification. However, there are opportunities for the supply of energy (in particular, power) for holdings that generate their own energy (decentralised generation supplementing supplies from the power companies).

Mushrooms
The competition from the former Eastern-bloc countries is expected to increase. In the longer term, these competitors' cost advantage will diminish as a result of the increased labour costs and more stringent requirements on the cultivation methods. Nevertheless, even more pressure will be imposed on the mushroom sector.
The need for cost control will result in continuing increases in scale. The many years' poor profitability will result in a further decline in the number of holdings, although production will remain at approximately the same level (figure 7.7). The number of holdings serving the preserves market will decline more rapidly than the holdings serving the fresh mushroom market.
The short shelf life of the fresh product imposes stringent requirements on the cultivation and production processes. Technologies that prolong the shelf life (new packaging methods) are not expected within the short term.
The processing of fresh produce will shift more towards the growers.
The increases in scale of the primary production holdings and the communications with their surroundings both give cause to the need for a professional organisation. Competences such as management, entrepreneurship and HRM will become important. Employee vocational training will need to be organised in-house, since specific mushroom training courses are no longer available. In addition to the quality of the labour, the recruitment of employees will also be an issue requiring attention. Labour costs in the Netherlands are too high, in particular for harvesting, and even in spite of the deployment of employees from the new EU member states. These circumstances give cause to collaboration with other growers and/or traders.
Genuine product innovations would offer the sector unique selling points. However, it is a moot point whether the sector will retain the critical mass required to support the necessary innovations.

TEMPTING CONSUMERS WITH A VARIETY OF DAIRY PRODUCTS



Chapter 8

Pasture-based livestock farming complex

8.1 Current position

8.1.1 General

The pasture-based livestock farming complex includes cattle, sheep, horse and goat farms, the associated slaughterhouses and the dairy industry, as well as the supply companies. In 2003, the pasture-based livestock farming complex had a 28.4% share in the added value of the total agricultural complex. Although this is consequently the most important sub-complex, its share is nevertheless declining: in 1995, this share was still more than 5% greater than the current share.
The Netherlands is a major exporter of dairy products to other EU member states, in particular cheese (figure 8.1). Germany is the major market. However, the Netherlands has lost market share in Germany, which now imports many dairy products from Austria since its entry to the EU. France and Germany are the Netherlands' main competitors in the Belgian dairy market. The growth in sales of dairy products in the EU has levelled off in recent years, and the European market is showing signs of saturation. Moreover, WTO agreements have complicated subsidised exports to third countries, and this has in turn resulted in increased competition on the EU market.

Within the sub-complex, the primary sector's added value came under great pressure in 2003, certainly in comparison with its major share in employment (figure 8.2). The discrepancy between these shares is in part due to the small size of other grazing farms, where the jobs are counted as full jobs in the employment figures. In 2003 this related to 19,000 farms with an average size of 23 DSUs as compared to an average of 96 DSUs at dairy farms (DSU = Dutch Size Unit; 1 DSU = 1.15 ESU).
The workforce declined sharply in the processing sectors -in the dairy industry in particular -during the period between 1995 and 2003, with a decrease of more than 4,500 alu (-20%). However, the distribution sector exhibited a slight absolute growth in employment.

8.1.2 Suppliers and processors

The compound feed industry, in which more than 70 companies are still active, constitutes one of the complex' most important supply sectors. These companies produce about 3.5 million tonnes of compound feed for cattle, equivalent to one-quarter of the total production of compound feed.

Highlights

Current position

Large-scale and internationally-oriented dairy industry

Cheese most important export product

Number of dairy cows has decreased as a result of production quotas and the increased output of milk per cow

Dairy livestock sector largest user of land (more than 1 million hectares, including silage maize) in the Netherlands, thereby largely determining the appearance of rural areas and the landscape

Partner in diversification

About 40,000 grazing farms

Dairy farms are relatively large and intensive: substantial assets

Great differences in cost prices and operating results

Many farms active in nature management

Driving forces

Increasing international competition and pressure on prices as a result of the reform of the CAP and the WTO

Increasing costs as a result of the manure policy, Water Framework Directive, and ammonia policy

In some areas, dairy livestock farming is forced to make way for urbanisation

Increased transparency of the chain as a result of ICT

Product innovation in the dairy industry

Innovations in the primary sector relating to labour (milking robot), accommodation, and the environment

Prospects

Increases in scale and declining employment in processing and sales

Differentiation strategy to retain and/or expand market positions.

A degree of relocation to arable farming areas

Fewer cows in fields; more horses

Farm results under pressure as a result of liberalisation and CAP reforms

High price of quotas is an indicator of confidence, but also an impediment to restructuring

Continuing increases in scale focused on cost price reductions; number of farms will decline substantially

'Green' and 'blue' services as supplementary source of income

The eight largest companies, of which six are cooperatives, account for three-quarters of the total production.
The production of the cattle farming sector is comprised of milk and beef. The milk is produced at 25,000 mostly specialised farms, whereby cattle and beef are inevitable by-products of the dairy operations. Virtually all milk is delivered to dairy processing organisations. The Netherlands has 13 of these organisations, which process the milk in a total of 55 factories. Of these, 41 are owned by five cooperatives and the remainder are owned by eight private companies. Contracts assure these companies of receiving a specified quantity of milk. Quality assurance plays a pivotal role in the dairy industry, whereby the quality is controlled by the milk price and a quality assurance system.
The dairy industry exhibits a pronounced concentration on both a national and an international scale. In the Netherlands, two cooperatives – Campina and Koninklijke Friesland Foods – are responsible for processing more than 80% of all the country's milk. Danone and Lactalis in France and Arla Foods in Denmark/Sweden are the dominant dairy processors in their respective home markets, and are also important players in the European dairy market. Until recently, this was also the case for Italy's Parmalat. Campina's (European) home market extends to the Benelux and Germany; the cooperative is also seeking expansion in countries including Poland and Russia. Friesland Foods has participating interests in Eastern Europe and Asia. Both Dutch dairy processors rank amongst the top ten largest European dairy companies.
The concentration of dairy companies and the internationalisation of their operations are continuing. A concentration process is also underway in the Irish, French and German markets. At the end of 2004, Campina and its Danish/Swedish colleague Arla Foods announced plans for a merger, although this later fell through. This merger would have resulted in the largest dairy company in the world bar one, the Swiss Nestlé concern. In addition to takeovers and rationalisations, both Dutch dairy cooperatives are also investing in their brand policies.
The Netherlands still has seven cattle slaughterhouses, with a total slaughtering capacity of more than 10,000 animals per annum. Four of these companies account for 75% of the total slaughtering capacity for adult cattle. The two largest players are Kroot Vlees – part of Dumeco – and Weyl Beef Products, which are jointly responsible for 40% of the slaughters. About 615,000 head of cattle were slaughtered in the Netherlands in 2004, of which almost 90% were cows. The proportion of bulls in these figures is declining rapidly; whilst 99,000 bulls were slaughtered in 2002, by 2004 this figure had fallen to just 59,000. These cattle were processed into a total of 188,000 tonnes of beef. In addition, 309,000 tonnes of beef were imported and 207,000 tonnes were exported. Consequently, the domestic consumption amounts to 291,000 tonnes of beef, equivalent to a per capita consumption of about 17.9 kg.

Figure 8.1

Dutch imports and exports of dairy products, average value of the years 2003 and 2004.
Source: Statistics Netherlands (CBS), processed by LEI.

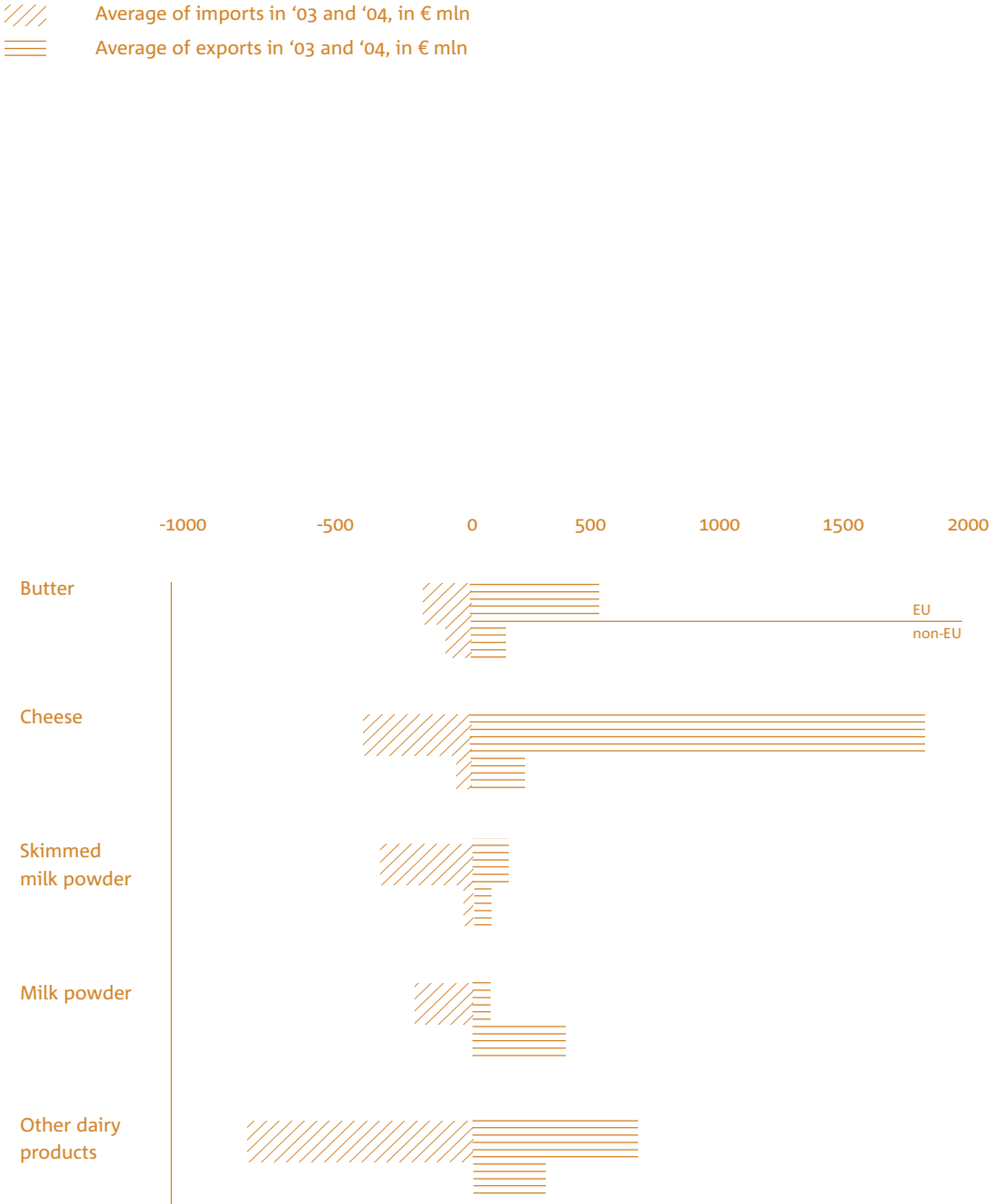


Figure 8.2

Breakdown (in %) of the added value and employment by sector in the total pasture based livestock complex, 1995 to 2003.
Source: LEI.

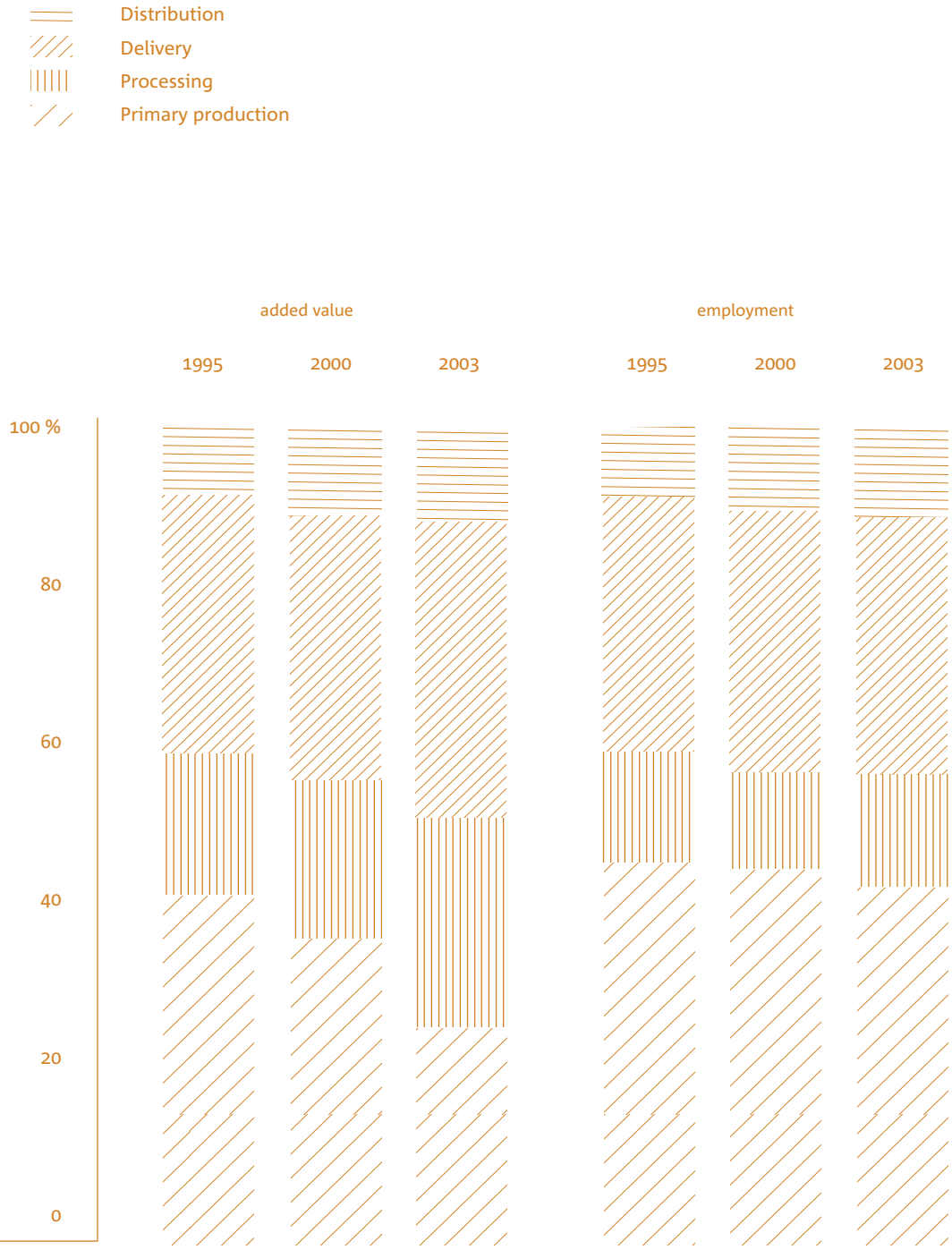


Table 8.1

Movement in numbers of dairy farms and dairy cows, 1990-2004

	1990	1995	2000	2003	2004
Number of farms with dairy cows	46,980	37,410	29,470	25,000	24,330
Number of specialised dairy farms	39,550	33,300	26,820	22,860	22,280
Number of dairy cows (x 1,000)	1,878	1,705	1,504	1,478	1,471
of which on specialised farms (%)	90	93	93	94	94
Average number of cows on specialised farms	43	48	52	61	62

Source: CBS *Landbouwtelling* (agricultural census).

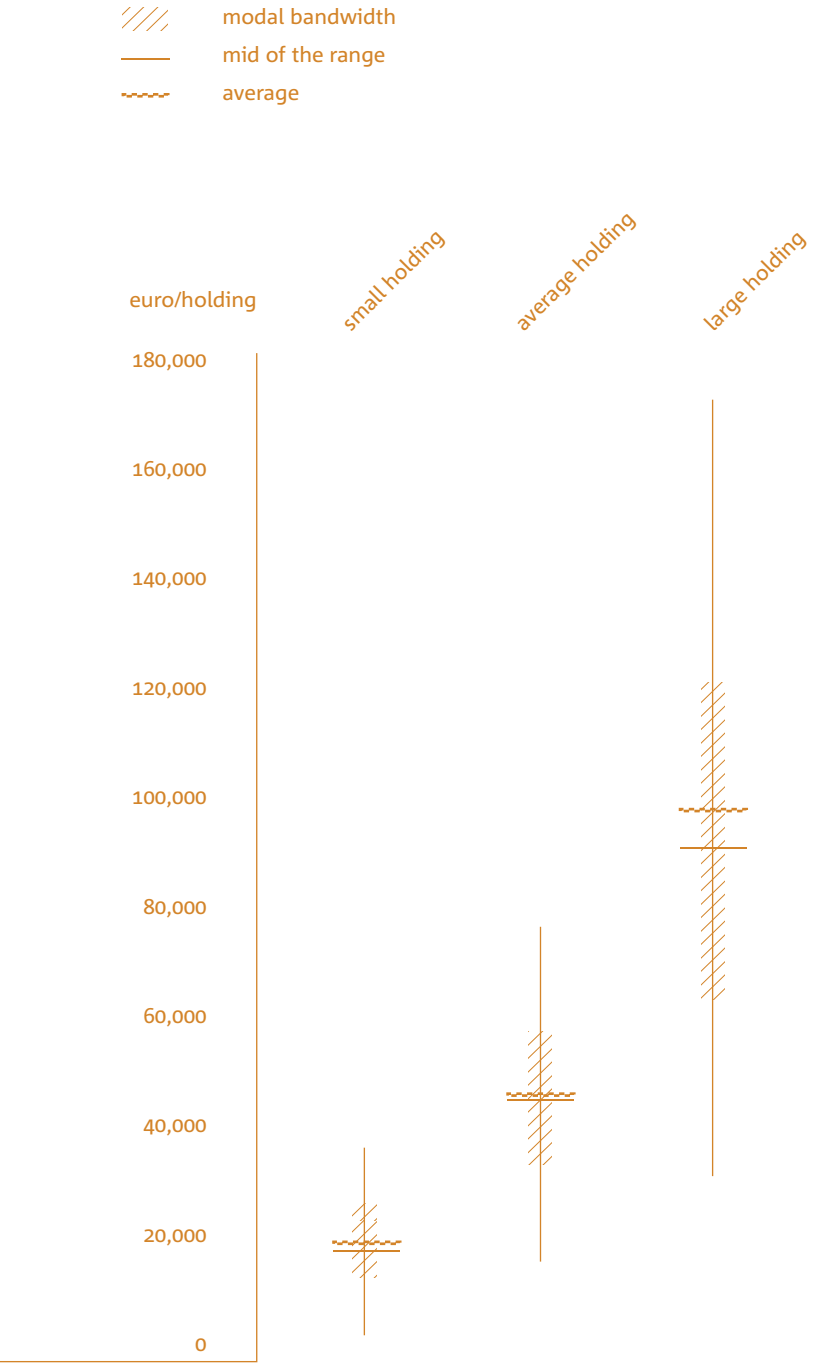
8.1.3 Dairy farms

The Netherlands has about 40,000 grazing farms, of which the dairy farms (more than 22,000 in 2004) are the largest sector. This sector still has a very favourable image. Dairy farmers' incomes have declined in the past few years due to their increasing fixed costs and the falling milk prices. In analogy with the other sectors, there are large differences in the incomes between the farms (figure 8.3).

The number of the Netherlands' grazing animals has fallen by about one-quarter since 1980, and the number of farms with grazing animals has almost halved. The average number of cows on dairy farms has increased from some 40 in 1984 (the first year of the milk quotas) to the current approximately 60 (table 8.1). Since 1980, the percentage of farms with more than 100 cows has increased from 3% to 10%, and these farms now account for more than 20% of all dairy cattle. On average, the dairy farms in Friesland are the largest in the country.

Figure 8.3

Differences in family farm income on dairy farms by size category, average 2001-2003
Source: LEI.



Increasing difficulties are encountered in the integration of a grazing period for dairy cows, in particular on the larger farms. In 2002, one in eight Dutch cows were virtually never put out to pasture. The reasons for the use of forage feeding can vary from farm to farm, although this is often due to the farm's relatively small acreage of grassland. In view of the growth of dairy farms, a further increase in forage feeding is to be expected, a development that is meeting with public disapproval.

The dairy farming sector is the largest user of land in the Netherlands, as a result of which it largely determines the appearance of rural areas, the landscape, and the nature of the Dutch primary agricultural and horticultural industry. This sector has great interest in agricultural nature management, and many dairy farms and other grazing farms are active in this area (see chapter 2).
In terms of the operating results, the Netherlands no longer enjoys a leading position in the EU, although the country has retained a high ranking. During the past few years (2002, 2003, and the beginning of 2004), the entire EU dairy farming sector has been confronted with falling milk prices. In addition, a number of background factors are less favourable for the Dutch dairy farming sector. In the Netherlands, the acquisition of milk quotas, in particular, imposes a greater burden on the costs – as a result of differences in quota prices and transfer procedures – than in the other EU member states. This results in lower margins than in other countries, and in increased problems in funding farm expansions and takeovers.

8.1.4 Other livestock farms

In addition to the (specialised) dairy farms, pasture-based livestock farming also encompasses beef cattle (nursing cows, fattening bulls), sheep and goat farms. Furthermore, a variety of service providers also assist the dairy farms, with services including rearing cattle, finishing the fattening of cows, and the cultivation and supply of forage. These forms of service could increase.
The number of other grazing farms, which has remained relatively constant in past years, is in excess of 18,000. These have an average of more than 10 hectares of land. These are often smaller farms operated by retired farmers and owners running them as a side-activity. The decline in the number of farms due to the definitive termination of operations is compensated by companies that stop milk production and then often join this category. This process will continue in the coming years.
The decoupling of farm payments can be detrimental to the number of fattening bulls, nursing cows, and sheep. However, the generally-expected favourable developments in the cattle market due to the reduced supply of beef cattle could limit this decline. The number of fattening bull farms has already declined considerably during the past few years due to the reform of the beef policy and the effects of the BSE affair; some of these farms have switched to pink veal production (see chapter 9). Nursing cow operations are usually accommodated in agriculture nature management,

an approach which will continue to be of importance in the coming years. The number of sheep has declined during the past 15 years.
During the past 20 years, the milk quotas have in part resulted in the emergence of milch goat farms as an alternative to dairy operations. The Netherlands now has some 300 (specialised) farms producing goat's milk, most of which is used to make goat's cheese. During the past few years, the size of this sector has stabilised due to the restricted market for the produce.

8.1.5 Horse farms

Although further studies and data are required, the initial impression is that the horse farming sector is increasing in size. In any case, the figures from the agricultural farms participating in the CBS *Landbouwtelling* (agricultural census) indicate an annual increase in the number of horses and ponies (approx. 130,000 in 2004). Horse operations on farms can be regarded as a form of diversification; the farms' own horses and ponies can be supplemented with animals owned by members of the public, which consequently generate income. Often the income from the farmer's horses will be restricted to their breeding horses, and in general other horses and ponies kept as hobby animals will not generate any income.
Professional horse businesses operated other than on farms are run for a variety of reasons, i.e. recreation, sport, breeding, etc. In some areas, a proportion of the agricultural land is used for these purposes (such as in the Randstad conurbation). The 'Livestock, Meat and Eggs Commodity Board' (the PVE) estimates the total number of horses and ponies at 400,000 (at least).

8.2 Driving forces

8.2.1 Market, CAP and WTO

The competitive position of the Dutch dairy sector has deteriorated in the past years. Cheese sales have declined in all three of the most important markets (Germany, Belgium, and France). However, the Netherlands has regained market share in butter in Belgium during the years from 1999 to 2003. The Netherlands has been able to retain its position in other German dairy produce markets. The competition in the EU dairy market is increasingly being determined by large international dairy and retailing concerns. Investments in product innovations, marketing and brands are of great importance to the Dutch dairy farming sector. These investments are only possible for powerful international dairy concerns.
Within the chains, quality assurance systems will need to offer continued guarantees for the safety of the products and the conformance of the production process with other societal requirements. The dairy companies are continuing the initiatives within the scope of the Chain Quality Milk. The requirements imposed by the chain (dairy companies, the retail trade) on dairy farms are such that the conditions attached by the EU (cross compliance) for eligibility for farm payments will not cause any additional problems.

The sector's demonstrated vulnerability to animal diseases (foot-and-mouth disease, BSE) will need to be countered by agreements and regulations relating to animal origins (and their traceability), their transport, and the types of feed they receive. Companies in the chain will bear increased responsibility for these measures. This will result in further professionalisation and increases in scale.

EU dairy policy

The reform of the CAP (decisions taken in 2003) will result in a reduction in the livestock farmers' yield prices. Since this reduction will not be compensated in full, their incomes will come under pressure. Their income will depend greatly on farm payments, which will be decoupled from production (quantities). For the time being, the milk quota will be retained within the EU.
The new WTO agreements in the Doha round could result in a reduction of EU market protection to an extent such that milk quota no longer serve a purpose in supporting milk prices. However, this will not be an issue during the coming years (until 2015). Nevertheless, the EU will be compelled to admit more dairy products onto its market, whilst exports of produce with export subsidies will be restricted (in the longer term without restitutions, depending on the WTO). This will not automatically imply a decline in exports of dairy products by the EU (and the Netherlands) to other countries in the event of a favourable development of the global economy and an increasing demand in countries undergoing economic development; however, prices will fall. The Netherlands is confronted with competition, in particular in the bulk product market, from countries outside the EU that have lower production costs.
Within the EU, the Dutch dairy farming sector has relinquished at least part of its lead in the income and structure of the dairy farms, where the high prices of land and quota have played a role. At the same time, these high quota prices are also indicative of the sector's strength and dynamism. Consequently, in the event of the abolition of the quota, the Dutch milk production figures will remain at least at the current level (see section 4.4.3). With the reduction and decoupling of income support, European (dairy) livestock farming in those regions with less favourable production conditions and/or a poor infrastructure (both physically, and in the chain) will decrease in size unless higher farm payments are made in the relevant regions. In the Netherlands, the manure policy will constitute the limiting factor for the expansion of production levels.

8.2.2 Environment

The regulations relating to manure, water and ammonia are of importance to the future of the Dutch cattle-farming sector.

The Manure Act
The new manure policy imposes more stringent limits on the use of animal manure. This will result in increased manure surpluses, which will in turn increase the costs incurred in the disposal of manure. Farms with more than 70% grassland will be eligible for derogation, at least for the coming years. This permits an application of animal manure to a level of 250 kg nitrogen per hectare. Consequently, they will decrease their acreage of silage maize. It should be noted that the effects will be different at intensive and extensive dairy farms. Farms with a large number of animals per hectare (> 2.5 LU/hectare [LU = Livestock Unit]) will either need to dispose of manure or acquire land to spread their manure. Most farms with a large number of cattle are located in sandy regions. Cattle manure competes with pig manure and poultry manure in the manure market. The intensive livestock farms, with virtually no space to spread manure on their own land, suffer from the additional disadvantage of relatively higher disposal costs as compared to those incurred by dairy farms.

Water Framework Directive
Additional source and effect-oriented measures will be required should the Manure Act prove insufficient for compliance with the Water Framework Directive's targets. These measures could be comprised of reduced quantities of manure, other manure administration methods, the cultivation of more environmentally-friendly crops, buffer strips, purification, and the discontinuation of the use of agricultural land. The application of this Directive could result in higher costs per hectare, an increased manure surplus, and increased manure disposal costs. Any such effects will depend greatly on the manner in which the Netherlands implements the Directive.

Ammonia Directive
The dairy farming sector is responsible for 55% of the ammonia emissions by the Dutch livestock sector, and will need to make a contribution to the reduction of these emissions. This contribution could, for example, be made by the implementation of measures that allow cows to be kept in the cowshed throughout the year, an approach that would be accompanied by increased costs; feeding cows in accordance with the standards (no excess of protein/nitrogen); working manure into the soil on grassland; a reduction of the number of cows; zoning around Wild Birds and Habitats Directive areas where relocation or new locations are not possible and, as an exception, expansion *is* possible. As a result, the ammonia policy will result in increased costs and reduced numbers of livestock. The effects will vary greatly from region to region.

Conclusions
The environmental policy will result in increased costs for dairy farms, in particular for those in sandy regions. The cattle sector cannot implement further intensification. The cattle density, which has already been reduced

during past years, will need to be further reduced at many farms. Although derogation has been granted for 250 kg nitrogen/hectare at farms with more than 70% grassland for the next four years, it is nevertheless possible that on the expiry of this period the European limit of 170 kg/hectare will be applicable to all farms. The position of the dairy farming sector would appear to be sufficiently strong to enable it to withstand pressure from the other livestock sectors; the mineral problem imposes considerably greater restrictions on intensive livestock farms, whilst extensive livestock farms are less profitable. The regulations, inclusive of those relating to ammonia and the implementation of application limits, will impose a certain degree of additional pressure on dairy farmers' incomes.

8.2.3 Space

The pasture-based livestock farming sector is widely dispersed throughout the Netherlands (figure 8.4). Urbanisation pressure has been high in the Randstad conurbation for a long time, and livestock farming has been compelled to relinquish land in the region. This trend is expected to continue. Urbanisation offers a certain degree of diversification options that can help farms to continue their operations. However, this will not strengthen the sector as a whole.

The effects of the need for land for non-agricultural purposes (housing, business, roads, nature, recreation, widening rivers, etc.) are particularly great on livestock farms in the west, middle and south of the Netherlands. The sector can compensate this loss of land by relocating farms to areas currently dominated by arable farming (the north, south-west, and Flevoland). In addition, farms will be relocated from intensive areas in which the opportunities for development are restricted or endeavours are being made to achieve extensification, such as the National Ecological Network areas. However, it is possible that in-depth specialisation could develop, whereby farms arrange for the cultivation of a major proportion of their forage at farms in the region. A similar development could emerge in cattle rearing.

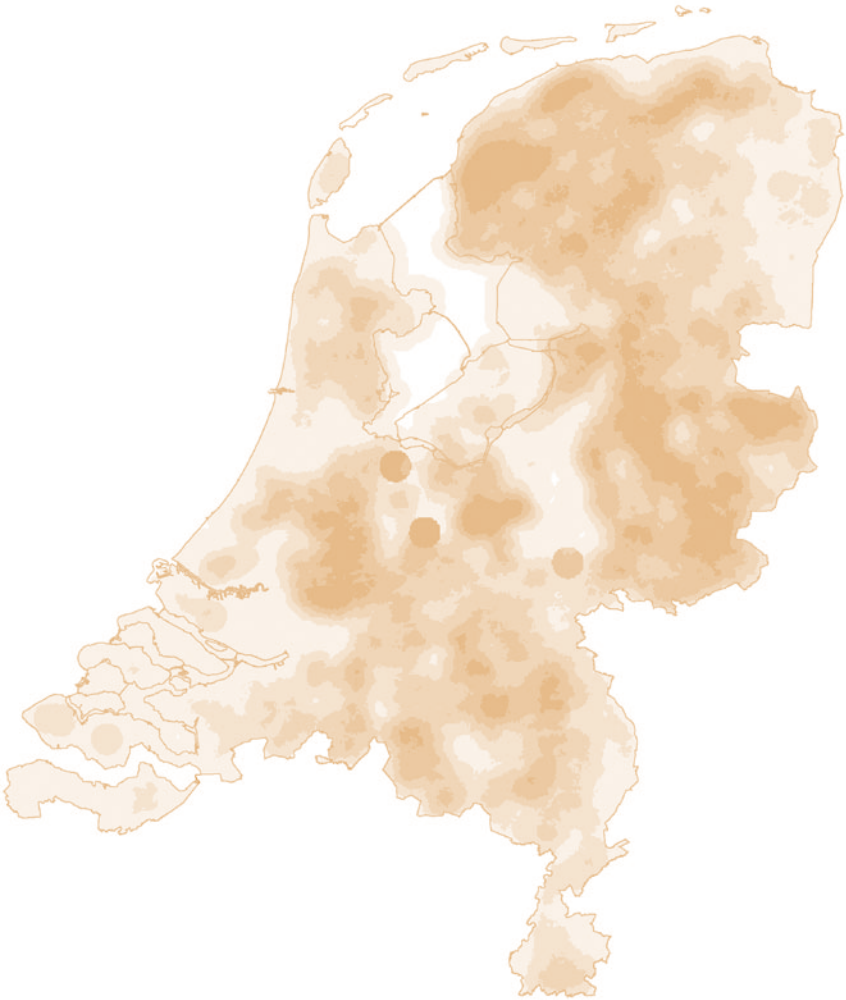
Many pasture-based livestock farms are located in the sandy regions of Overijssel, the Achterhoek, and North Brabant. Diffuse urbanisation will develop further in these regions, since they are appealing for housing, business, and recreation. This could result in the more stringent enforcement of environmental requirements on dairy farms, and to an increased number of public inquiries relating to proposed changes in farm operations.

8.2.4 Technology

Product innovations in the pasture-based livestock farming sector are taking place in the processing sector. Innovations in the primary sector relate to issues such as labour, the environment, accommodation, and forage.

Figure 8.4

Pasture-based livestock farming regions (based on DSU/ha; the darker the area, the more DSU/ha)
Source: Alterra.



Automation
Automation, robotisation and efficiency improvements contribute to the control or reduction of labour costs and the alleviation of the labour burden. One innovation that has already been introduced relates to the Automated Milking System (AMS), also referred to as the 'milking robot.' In comparison with conventional milking procedures, this results in a decreased number of hours' labour, as well as a reduction in the physical and mental labour burden. The relatively high costs in the dairy farming sector (labour costs account for 1/3 of the production costs) give cause to the continued search for innovative technologies (such as the mobile milking robot).

Co-fermentation
The fermentation of animal manure in combination with co-substrates (co-fermentation) to produce biogas can save fossil energy, reduce manure transports, lower stench emissions, and decrease mineral nitrogen losses. Although the technology is available, investing in co-fermentation installations is confronted with problems relating to economic and policy preconditions.

Accommodation and grazing
The accommodation for farm animals serves a variety of functions, such as shelter, milking, rearing, finishing, feeding, mucking out, etc. Technology has rendered increases in scale a feasible proposition. In recent decades, this development has been further enhanced with the emergence of new types of cowsheds, stables and sties, new materials and new designs (circular cowsheds).
The Virtual Electric Fence is an innovation that provides for grazing in nature areas. This system is comprised of a GPS guidance system for cattle (dairy cows, beef cattle and control cattle), and serves as a virtual enclosure. When a cow approaches a virtual boundary, an audio signal is generated by a speaker attached to a collar around its neck, and the cow then turns back.

Forage
Major efficiency improvements have been achieved in the dairy farm production of forage during the past decade. Endeavours are being made to achieve further improvements in forage production by monitoring the course of cultivation. The measurement methods currently available to dairy farmers for the control of forage production, laboratory analyses, offer solely retrospective information since these analyses require a considerable amount of time to perform. Technologies have recently been developed for rapid measurement methods. Optical methods, inclusive of spectroscopy, would appear to possess potential for the on-site determination of the dry-solid yield, composition, and feeding value of the grass.
A further technological development is mobile defractionation. The pasture-based livestock farming sector could use this technology to extract a fraction of the protein directly from the forage -which would be beneficial in view

of the prevailing protein surplus. This would result in an improved nutritional balance in the pasture-based livestock farming complex, and would allow for sales of protein to the feed industry for the intensive livestock farming complex.
Models are required to determine the optimum composition and quantity of feed on the basis of cows' individual production data designed to ensure for the optimum utilisation of the farm's feed requirements. Models of this nature are already available for concentrated feed (the *Dynamisch Krachtvoer Advies Systeem*, 'Dynamic Concentrated Feed Advisory System,' DKAS).

Transparency in the chain
Food safety, animal welfare and quality are all issues of great importance to livestock farming. The European market currently places a strong emphasis on safety. Virtually all investments in this sector are focused on the improvement of safety by means such as increasing the transparency of the chain. ICT plays an important role in these endeavours.
Internet applications now in use for many years enable dairy farmers to track their milk deliveries and obtain an insight into the composition (and price) of the milk. The dairy companies have recently launched their own Internet applications.

Biotechnology
The experiment with Herman the bull, in which specific products were produced by cows, will not be followed up for the time being. More profitable alternative approaches to this type of development would appear to be offered, for example, by blue technology (such as production using algae).

8.3 Prospects

8.3.1 General

Pursuant to the reference scenario, the nominal added value of the complex will increase by about 7.5% in the years up until 2015 (table 8.2). However, in real terms, this constitutes a decline in the complex' added value. In the same period, employment offered by the complex will decline by more than 15%. This decline will largely be due to the continuing increases in scale and the expected fall in the number of livestock farms. All in all, there will be a marked decline in the pasture-based livestock farming complex' share within the total agricultural complex, both in terms of added value and employment. Within the pasture-based livestock farming complex, the share of the primary production sector will decrease, and the share of the processing sector will increase. The significance of exports to the position of the complex will remain very high, i.e. more than 60%.
The prospects for the Dutch pasture-based livestock farming complex are not unequivocally favourable. The complex is confronted with increasing competition in both the European and global markets. The dairy cooperatives are expected to engage in product development and innovations that

Table 8.2

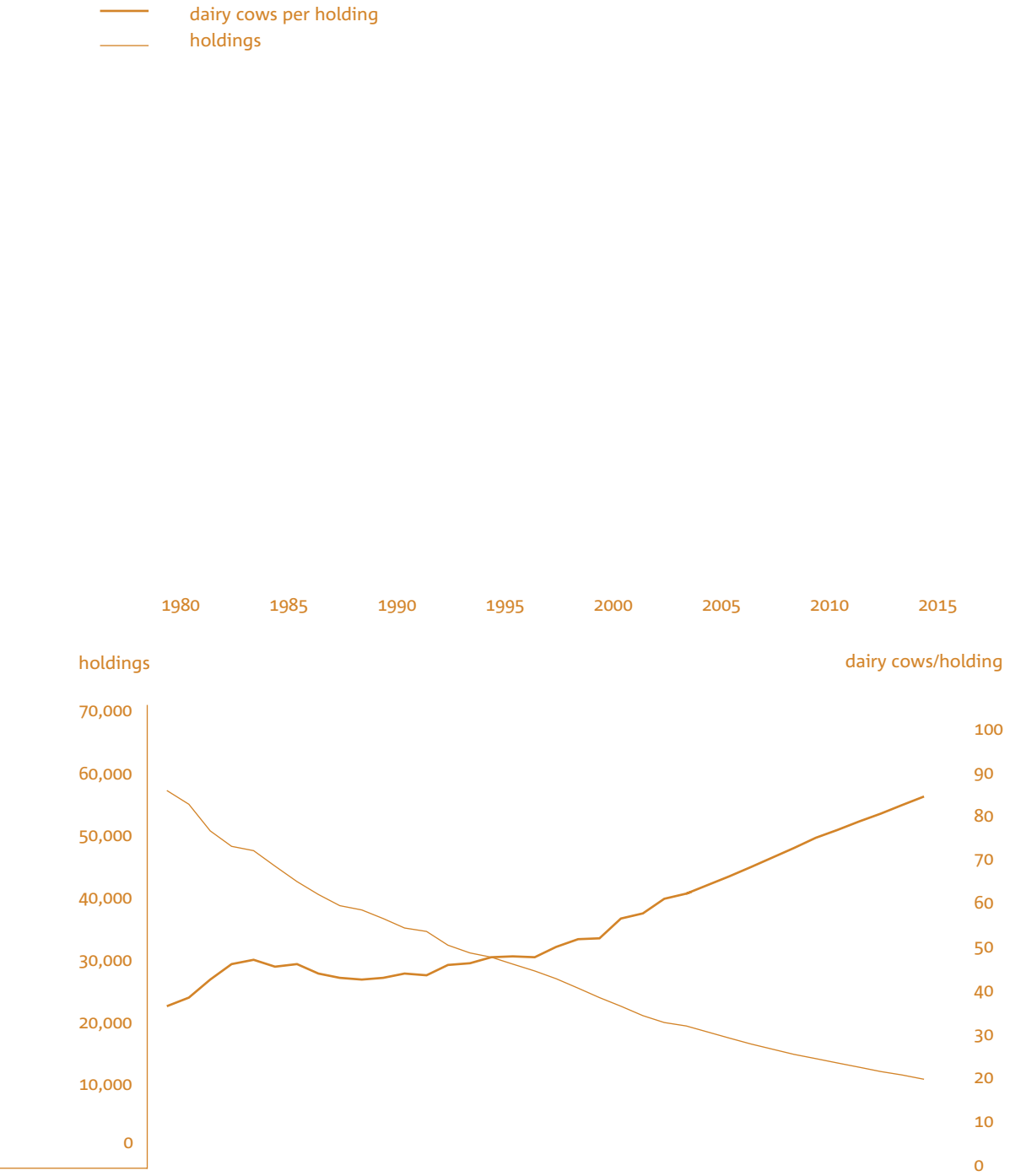
Breakdown of added value and employment (alu) by sector in the pasture-based livestock farming complex in 2003 and 2015

	Added value				Employment			
	2003 € million	%	2015 € million	%	2003 alu	%	2015 alu	%
Pasture-based livestock farming, total	1,785	27	1,620	23	58,944	44	43,894	39
incl.: cattle farming	1,707		1,521		52,111		38,095	
other livestock farms	78		98		6,833		5,799	
Processing, total	1,753	26	2,219	31	17,686	13	15,533	14
incl.: cattle slaughtering	215		335		3,362		3,359	
other livestock slaughtering	38		61		485		498	
dairy industry	1,500		1,823		13,839		11,675	
Delivery, total	2,423	36	2,519	35	42,602	32	39,149	35
incl.: feed industry	52		55		1,095		961	
agricultural services	396		405		10,663		9,933	
wholesale	396		415		8,021		7,643	
banks, insurance	485		509		7,952		7,571	
Distribution	753	11	764	11	14,024	11	12,963	12
Total pasture-based livestock farming complex	6,714	100	7,122	100	133,256	100	111,538	100
In % of total agro-complex	28.4		26.5		33.6		31.8	
Export dependency (%)	62		62		64		65	

Source: LEI.

Figure 8.5

Number of specialised dairy farms and average number of cows per holding, 1980-2015
Source: Statistics Netherlands (CBS), and LEI.



retain the dairy farmers' milk price at the highest possible level in a period of reduced EU support and uncertainty about policy, inclusive of the situation with respect to farm payments. Dairy farmers need to reduce their costs if they are to generate sufficient income. However, at the same time they are confronted by the high price of land and quota, and by the associated financing expenses.
The pasture-based livestock farming sector will remain the largest user of Dutch land. However a slight decrease in the dairy farms' acreage of grassland and land used to cultivate feed will provide more space for other animals, such as horses.

8.3.2 Holdings

The future structure of dairy farms will be influenced by a number of factors. During recent years, the number of dairy farms declined by about 4% per annum. In view of factors such as the age structure of the current entrepreneurs – more than half are older than 50 – and the succession percentage (a little more than 50%), there is no reason to presume that this rate will slacken in the coming years.
On the basis of the current number of (specialised) dairy farms (more than 22,000 in 2004, with an average of some 65 dairy cows on almost 40 hectares), the forecasts indicate about 14,000 farms with an average of more than 80 dairy cows on more than 50 hectares in 2015 (figure 8.5). Consequently, in 2015, the average milk production of each farm will amount to some 800,000 kg; the current figure is about 500,000 kg.
In the event of a trend increase in the production per cow and an essentially unchanged but slightly larger milk lake (quota of approx. 11 billion kg +1.5%), the total number of Dutch dairy cattle will decrease by about 1.7% per annum. The number of dairy cows will then decline from the almost 1.5 million of the past few years to about 1.2 million in 2015.
It should be noted that the pace of the increases in scale and reduction of the number of farms could increase with a further liberalisation of policy (lower prices and farm payments), a more stringent manure policy and an increasing demand in the labour market. Conversely, the pace could be lower in the event that the public and policy place more emphasis on issues such as the landscape and sustainability that result in restrictions on the size of farm buildings, etc. The same will also be true if the developments in milk prices are more favourable than the current assumptions based on EU decisions.
Many farms endeavour to achieve increases of scale so as to maintain their incomes at a reasonable level. Other farms opt for limited (or no) expansion of their milk production, and focus more on diversification. A further group of farms close or discontinue their dairy cow operations. The recent prohibition on the structural leasing of the milk quota has temporarily resulted in more definitive farm closures since their rental income fell away and their sale generated liquid funds. A falling quota price could also result in more farm closures. However, this is not the

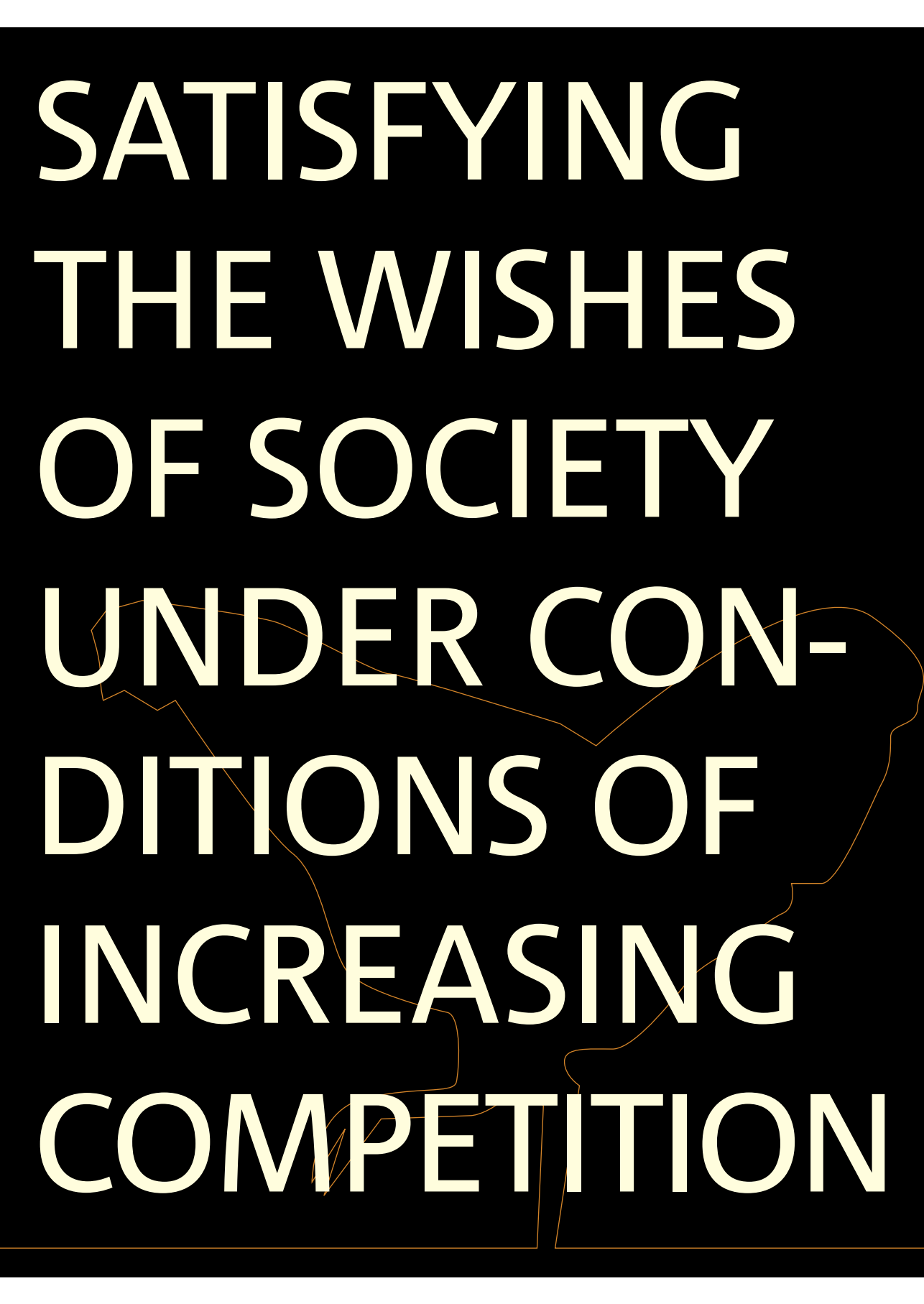
case with the decoupling of farm payments; these generate income on the continued use of the land (farmers can stop their milk production). A decrease in the price of milk quota will reduce the milk quota investments required for expansions. However, since profitability will come under pressure from the falling prices, the total scope for investments will certainly not be greater than in recent years.

When viewed from a geographical perspective, milk production will continue to shift from the south, west and middle of the Netherlands to areas with more space, such as the arable farming region in the north of the country. These relocations to areas that usually have an appropriate division of land, etc, will result in the emergence of a larger number of powerful farms that will also be able to collaborate with arable farms (disposal of manure, cultivation of forage, exchanges of land for crop rotation). In addition to these relocations within the Netherlands, every year a number of dairy farmers decide to emigrate to other EU member states or other countries. The lower prices for land and quotas than in the Netherlands enable them to start a larger farm in their new country.

In view of the sector's image, the wish for cows to be seen in the fields will certainly continue to be heard in the future. However, a continually declining number of farms will be unable to fulfil this wish with a view to the management of the operations, the costs, and the location of the farm (labour, minerals policy, the division of the land and the distance to be covered by the cattle).

In view of their current position (the nature of the farm, the area), dairy farms and other pasture-based livestock farms are, in relative terms, diversifying more actively than other farms in the agricultural complex. The major area of dairy farming diversification is into agricultural nature and landscape management, which can often readily be accommodated in their operations (for example, the modified management of a proportion of the farmland). Other potential areas of diversification, such as agri-tourism, care farms, and the processing and sale of produce are only really feasible for farms of a certain size as a result of the necessary investments and number of employees.

SATISFYING THE WISHES OF SOCIETY UNDER CONDITIONS OF INCREASING COMPETITION



Chapter 9

Intensive livestock farming complex

9.1 Current position

9.1.1 General

The primary sectors of the intensive livestock farming complex encompass pig, laying hen, broiler and veal farms. In addition, the complex also extends to companies that supply goods and services to these farms, such as feed products, and companies that receive products from the farms, such as slaughterhouses. In conclusion, the complex also includes companies focused on the trade in and distribution of products produced by the farms. In 2003, the added value of the total intensive livestock farming complex amounted to € 5.2 billion as compared to € 4.0 billion in 1995. In 2003, the complex' share accounted for 22% of the added value and about 20% of the employment of the entire agricultural complex. In recent years, exports contributed 78% to the total added value. In the past few years, the intensive livestock farming complex' production value was about € 3.5 billion. The 2003 production value of € 3.1 billion was relatively low, which was largely due to the consequences of the outbreak of fowl plague (Avian Influenza) and the low pig prices.

The pig farming sector makes the largest contribution to the production value of the intensive livestock farming complex (about 55 to 60%). The Dutch pig farming sector has a share of almost 10% in EU pig production, and consequently still ranks in the EU-15 top five. The Netherlands is the second largest exporting country after Denmark.

In recent years, the exports of Dutch pork – the complex' most important export product (figure 9.1) – to the United Kingdom have exceeded those to Germany. The significance of the British market has also increased for Dutch poultry meat, whereby the BSE crisis and the high exchange rate of the pound sterling both played a major role. Poland has built up a good position in the German market. The deterioration of the Dutch position in the EU pork market is largely due to the reduction in the number of pigs. In recent years, this has resulted in a decline in the Dutch share of the EU's production of pork. The slaughterhouses went through a difficult period following the export of many live animals; foreign (German) slaughterhouses offered higher prices.

9.1.2 Suppliers and processors

The supply companies account for a large proportion of the complex' added value and employment (figure 9.2). The compound feed industry

Highlights

Current position

Major dependency on exports to EU market

Concentrations in supply and processing links of chain

High knowledge level and productivity

Problems with image relating to labour, environment, and animal welfare

Production of pigs and poultry in effect governed by quotas via animal production rights

Decline in numbers of pigs and poultry as a result of buy-up scheme pursuant to manure policy

Successful development of veal sector

Total of 10,000 farms

In the past few years, the results in pig and poultry farm sectors have been greatly influenced by a combination of animal diseases and unstable prices

Driving forces

CAP reforms and liberalisation in trade result in more competition and lower prices

Veal sector dependent on farm payments

Environmental policy (manure and ammonia) increases costs and restricts structural development of the pig sector

Animal-welfare regulations restrict size of poultry sector

Spatial planning imposes restrictions; reconstruction legislation offers opportunities for increase in scale

Technologies for manure processing, accommodation, product development and ICT contribute to the development of a more sustainable sector

Prospects

Variable prospects for the different sub-sectors: from a slight decrease (of broilers) to possibly even a slight increase (veal calves).

More competition from countries outside the EU

Declining employment

Enhanced harmonisation in the chain focused on fresh and processed high-quality products is intended to improve the position with respect to consumers and the retail trade

Reduction of losses in the chain through improved harmonisation within the chain

Major differences in farm results promote restructuring

Continuing increases in scale focused on reduction of cost price; substantial decline in number of farms

Few opportunities for diversification; supplementation of incomes by jobs off the farm and the valorisation of energy and heat using co-fermentation

in turn plays a major role within the supply company sector. The industry produces about 12.5 million tonnes of compound feed. Of this 12.5 million tonnes, 43% consists of pig feed, 25% each of cattle and poultry feed, and the remainder of other animal feeds. During the past few decades, various mergers and takeovers have resulted in a substantial decline in the number of compound feed companies. The production exhibits a marked degree of concentration, whereby the ten largest companies account for more than two-thirds of the total production. The largest cooperatives are Cehave Landbouwbelang, Agrifirm, and ABCTA. Hendrix UTD (Nutreco) and DeHeusBrokkingKoudijs are the largest suppliers in the private sectors. Most slaughterhouses and meat processing companies have traditionally been small companies, and in fact the Netherlands still has a relatively large number of small companies in these sectors. Both further increases in scale and the production of meat offering added value will be necessary if the Netherlands is to be able to play a leading role in the European meat market. During the past few years, the decline in the number of slaughterhouses has continued at an accelerated pace. Nowadays, the entire meat complex is highly concentrated. The six largest pig slaughterhouses account for 95% of all pig slaughters; the largest of these – VION – accounts for no less than 65%. Moreover, this company is the second largest pig-slaughtering company in the EU, with a share of over 8% in 2003. The four largest poultry slaughterhouses account for more than half of all poultry slaughters.
In the calf slaughtering sector, three companies account for more than 90% of the market. The largest of these is the Van Drie Groep, which accounts for more than 60% of calf slaughters. This group forms a fully-integrated chain, and has concluded contracts with about 1,000 veal farms, specifying that the Van Drie Groep supplies the farms with newborn calves and calf milk powder and that the farms fatten the calves and supply them – for a fee – to the Van Drie Groep's slaughterhouses.

9.1.3 Pig farming

In 2004, the Netherlands had more than 5,500 specialised pig and poultry farms. The numbers have declined greatly since 1990, and the number of specialised pig farms is now just half of that in 1990 (table 9.1). The total number of farms that keep pigs, about 10,000, has now fallen to just one-third of the number in 1990. The number of pigs has also exhibited a substantial decline, in particular following the introduction of the farm closure scheme in 2000. In the period between 2000 and 2004, the number of pigs fell by more than 15%, and the number of farms by more than one-quarter.
Pig farming, formerly one of the operations on mixed farms, is shifting to specialised farms as a result of mechanisation, automation, and increases in scale. This trend is developing more rapidly in the Netherlands than in most other EU member states. Specialised farms now account for one-half of all breeding pigs, and one-third of all porkers. The 300 largest farms (3%) account for more than 20% of the total number of porkers.

Table 9.1

Numbers of pig farms and pigs, 1990-2004

	1990	1995	2000	2003	2004
Number of farms with pigs	29,210	22,390	14,520	10,730	10,040
Number of specialised pig farms	9,200	7,710	6,060	4,340	4,185
of which: pig breeding farms	3,500	2,870	2,090	1,660	1,600
porker farms	3,690	2,960	2,420	1,590	1,535
closed pig farms	2,010	1,870	1,550	1,100	1,050
Number of pigs (x 1,000)	13,915	14,397	13,118	11,169	11,153
Number of sows (x 1,000)	1,272	1,287	1,129	950	954
of which: on pig breeding farms (%)	47	47	51	54	53
on closed pig farms (%)	21	25	28	25	26
Number of porkers (x 1,000)	7,025	7,125	6,505	5,368	5,383
of which: on porker farms (%)	32	28	33	31	34
on closed pig farms (%)	19	23	25	25	25

Source: CBS.

Chapter 2 indicated that farm family income usually increases with the size of the farm (section 2.3). However, in the years 2001 to 2003, pig farms constituted an exception to this rule, when the largest farms achieved far from excellent results (figure 9.3). This was during the dip in the pig cycle; pig farming incomes exhibited a marked improvement in 2004.

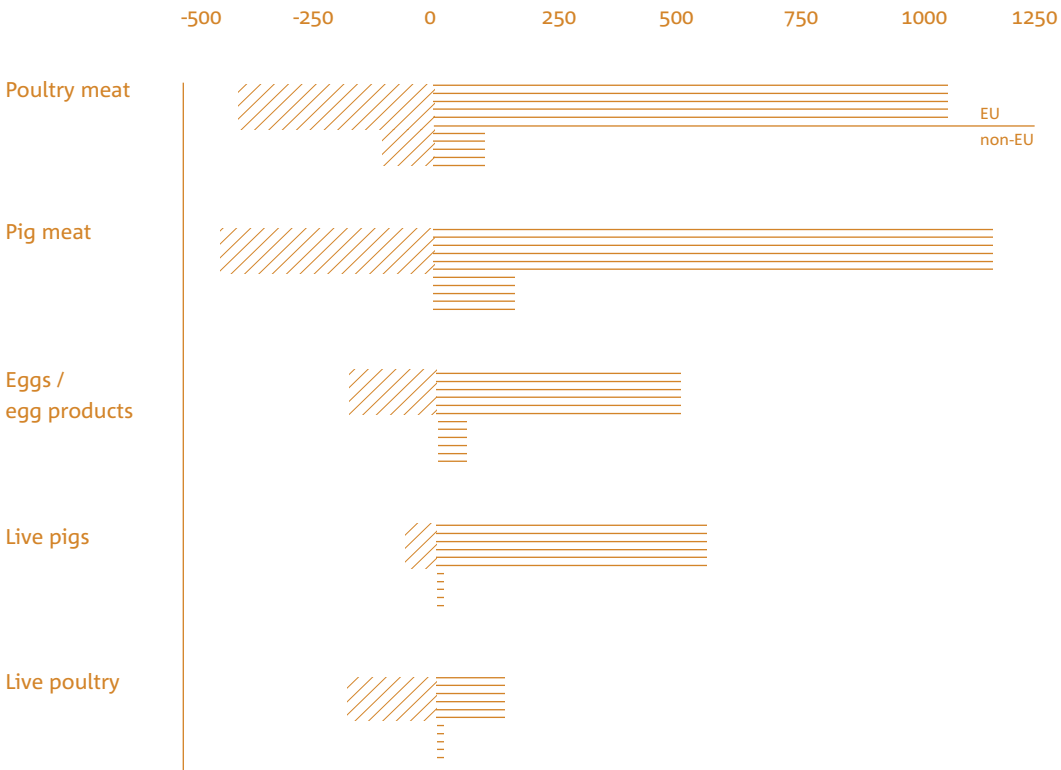
9.1.4 Poultry farming

The structural developments in the poultry farming sector are similar to those in the pig farming sector. In 2002, almost 30% of all animals in the laying-hen and broiler sectors were concentrated on farms with more than 100,000 animals, in contrast to the approximately 10% in 1980. The specialised farms account for two-thirds of the total number of broilers. Consequently, specialisation has developed further than in the pig farming sector.
The 2003 and 2004 results of the poultry farming sector were greatly influenced by the outbreak of fowl plague; although those farms that *were* still able to produce in 2003 achieved extremely good results, the results for

Figure 9.1

Dutch imports and exports of pig and poultry products, average value of the years 2003 and 2004.
Source: Statistics Netherlands (CBS), processed by LEI.

Average of imports in '03 and '04, in € mln
Average of exports in '03 and '04, in € mln



2004 were very poor due to the glut on the European market. In previous years, laying-hen farms usually generated substantially higher incomes than those at broiler farms. Broiler farms experience substantially smaller fluctuations in income than laying-hen farms. Most broiler farms supply their products under price agreements concluded within the scope of integration. Consequently, although the prices do not fluctuate greatly, this does not – in view of the results achieved for the past few years – constitute a guarantee for an appropriate income.

9.1.5 Veal farms

The (non-pasture-based) veal farming sector occupies a special position in the overall livestock farming complex. The sector is of importance to the dairy farming sector in the valorisation of calves not destined for breeding or milk production. The sector, with more than 1,000 specialised veal farms, possesses a reasonably strong position by virtue of its relationships within the chain (integration). These farms also fatten calves from other EU member states, and have since switched over to group pens. The majority of the produce is exported to other EU member states (Germany, France, Italy).
The majority of veal farming operations are located at specialised farms with little land. As such, the sector is confronted with environmental, spatial planning and animal welfare problems that are comparable to those in other sectors of the intensive livestock farming complex (pigs and poultry). In spite of the improvements achieved through the changeover to group pens, the veal farming sector still suffers from a poorer image than the dairy farming sector.
The production of pink veal has developed as an alternative to white veal and even red veal. Some pink veal is produced at farms that formerly ran fattening bull operations. The pink veal sector would appear to be stabilising at its current size. This production is dependent on the slaughter premium for adult animals (€ 80).

9.2 Driving forces

9.2.1 Market, CAP and WTO

When viewed from an economic perspective, the Dutch pig sector has lost some of its lead during the past few years. However, from a production perspective, the sector still achieves a very high score. The sector's market share has decreased, and the operating results reveal that pig farmers are lagging behind their colleagues in member states such as Spain, Italy and Belgium. Over the years, the sector has been confronted with great fluctuations in the yield prices – due to the pig cycle – and consequently with highly pronounced variations in farm incomes. Outbreaks of diseases, such as swine fever, can cause temporary major disruptions to the customary cycle. The same is also true for diseases that do not have a direct impact on the sector, such as the foot-and-mouth outbreak of 2001, but which nevertheless *do* confront the sector with transport prohibitions. During the past few years, the Netherlands has been confronted with

Figure 9.2

Breakdown (in %) of the added value and employment in the intensive livestock farming complex, 1995 to 2003.
Source: LEI.

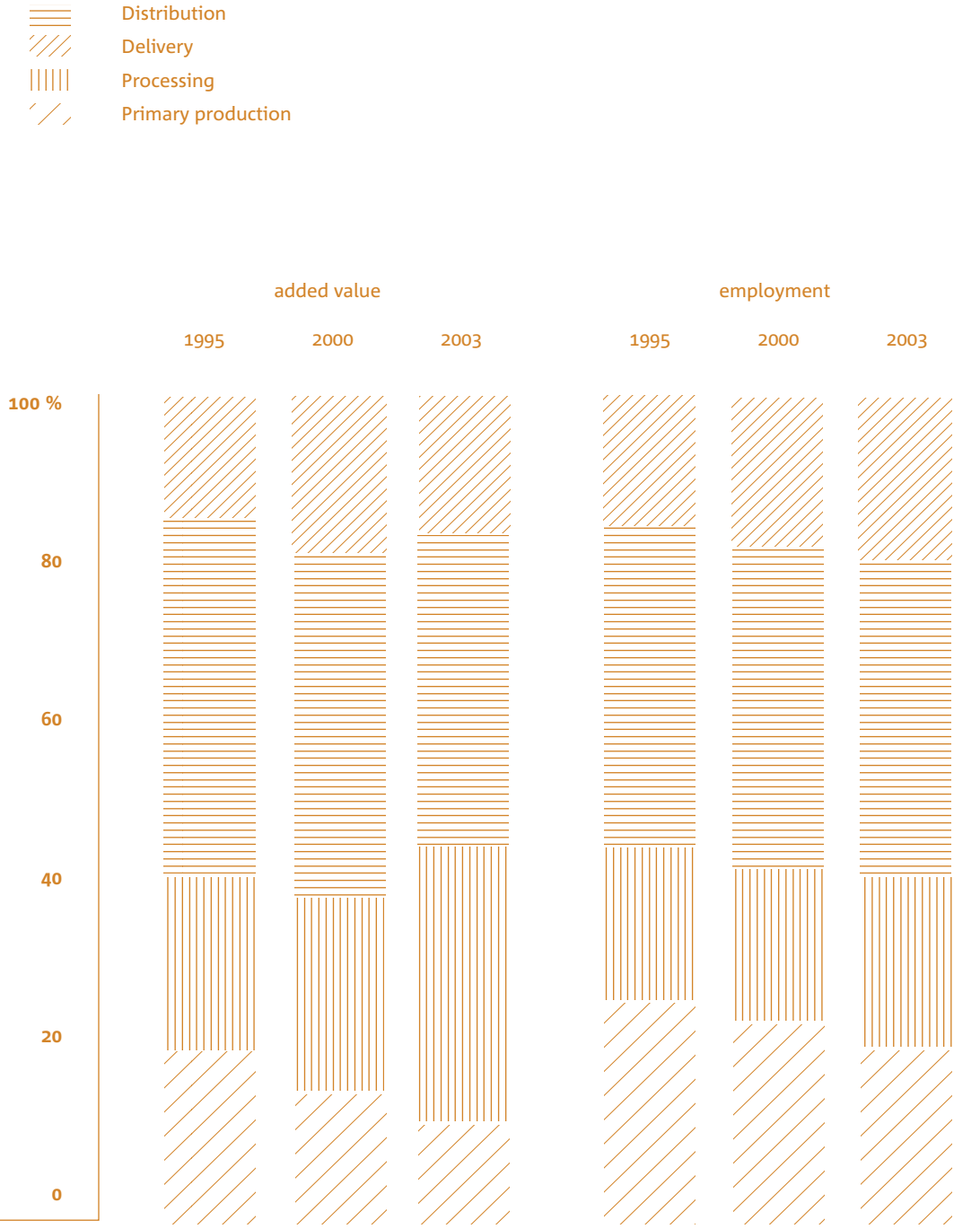


Table 9.2

Numbers of (specialised) poultry farms and birds, 1990-2004

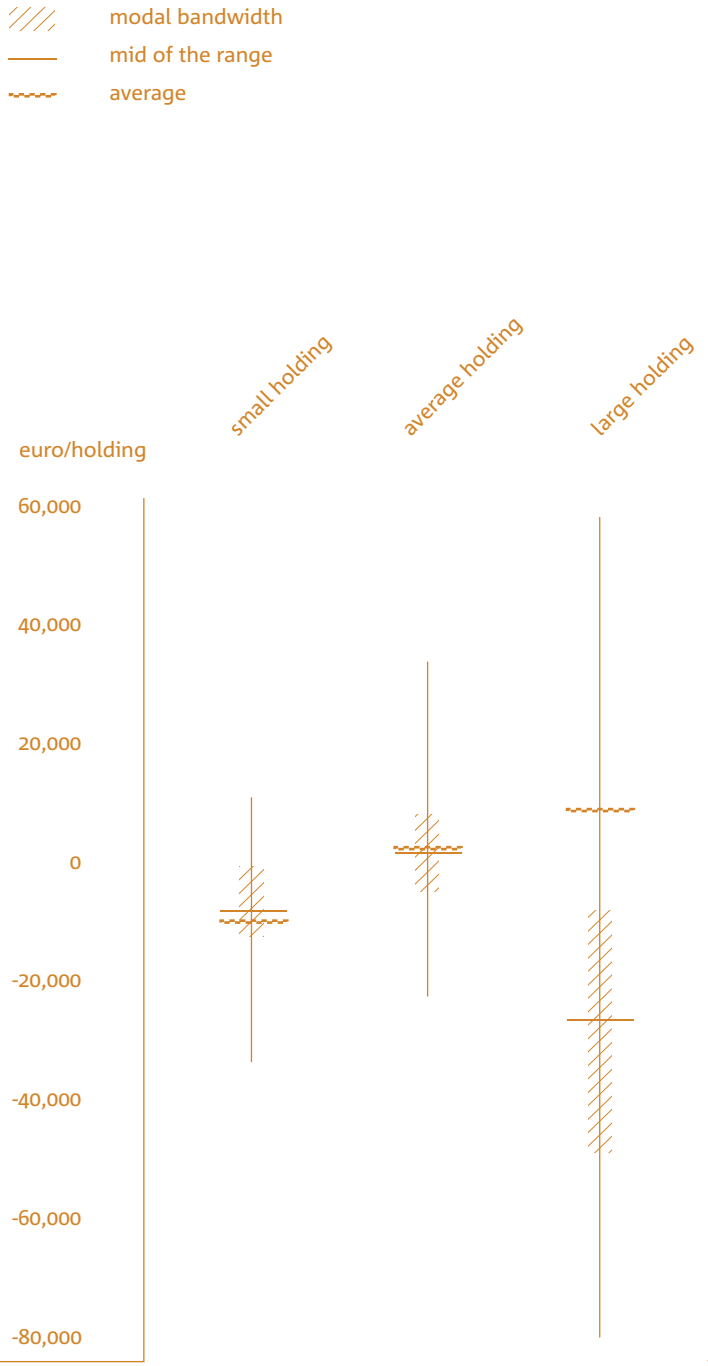
	1990	1995	2000	2003	2004
Number of farms with poultry	6,080	5,510	4,150	2,670	2,970
Number of specialised poultry farms	2,140	2,010	1,830	1,250	1,350
of which: laying-hen farms	770	720	660	450	550
broiler farms	620	600	540	380	370
Number of birds (x 1,000)	95,452	91,915	106,813	81,232	88,015
Number of laying hens (x 1,000)	33,199	29,297	32,573	23,947	27,219
of which: on laying-hen farms (%)	69	76	76	83	77
Number of broilers (x 1,000)	41,172	43,828	50,937	42,289	44,262
of which: on broiler farms (%)	60	62	66	67	67

Source: CBS.

several incidents that revealed just how vulnerable the livestock farming sector is to animal-disease issues. However, it should be noted that this is also applicable to livestock farms in other EU member states.
Although the Netherlands is in a favourable location for the European poultry market, the position of the Dutch poultry sector is nevertheless under pressure. This is caused by the increasing production costs, which are largely due to the more stringent animal welfare, environmental and food safety requirements imposed on the sector's production – increases that are not reflected in higher market prices. This is in turn partly due to the fierce competition from countries such as Brazil and Thailand. The fowl plague crisis at the beginning of 2003 greatly reduced the production and export of poultry meat and eggs. The country's competitors stepped into the foreign markets to fill the resultant shortfall in supplies. It is not inconceivable that this outbreak will result in a permanent reduction of the size of the poultry sector. Imports of cheap poultry meat from countries outside the EU are increasing, in particular from Brazil and Thailand. The further

Figure 9.3

Differences in family farm income on pig farms by size category, average 2001-2003
Source: LEI.



agreements within the context of the WTO will probably result in reductions in border protection that improve access to the European market and increase the price competition from countries outside the EU.
The expansion of the EU has had virtually no influence on the Dutch production output. However, by virtue of the prevailing trading culture – in particular, in the Netherlands and Denmark – it has proven possible to initiate new trade flows within a fairly short period of time (for example, the export of piglets to Eastern Europe).
Salmonellae and *Campylobacter* infections of meat and eggs are currently issues receiving a great deal of attention from consumers, and from the entire chain. The opportunities available to the Dutch intensive livestock chains on the EU market will increase with their ability to produce meat and eggs free of these infections. Developments abroad (such as in Denmark) have revealed that the improvement of food safety is a protracted process.

CAP and WTO
Until the beginning of the 1990s, the Dutch intensive livestock farming sector was characterised by its European cost-price leadership. At the time the Netherlands enjoyed a feed cost-price advantage by virtue of the 'Rotterdam gap' in the classical European grain market regulations. However, following the reform of the CAP, the Netherlands no longer has the lowest feed prices in the EU. In addition, the Dutch and European production costs are significantly higher than those of countries outside the EU.
The EU intensive livestock farming complex is protected by import duties that can rise to as much as 100% of the international prices (as is the case with Brazilian chicken breast). Since the Uruguay round, these import duties, in analogy with other products, are limited to a maximum by means of tariff equivalents. Moreover, they will be reduced by 36% during the coming years. Calculations reveal that these import duties already barely offer adequate protection for EU producers – in particular, the poultry meat sector – from imports from a number of countries outside the EU. Brazil and Thailand can produce at cost prices of a level such that even once the import duties and higher transport costs have been taken into account in the market price still they are still able to compete on the EU internal market. It has to be concluded that the EU's intensive livestock farming sector, in particular the broiler sector, will come under continually increasing pressure from competition from non-EU countries.

9.2.2 Environment and animal welfare requirements

Manure policy
The new manure policy imposes limits on the application of manure, in particular as a result of the requirement for the achievement of phosphate equilibrium fertilisation by 2015. This will cause increasing manure surpluses. The pressure on the manure market is manifested in the form of higher manure disposal costs. Consequently, the intensive livestock farms will be confronted with a proportional increase in manure disposal costs.

It is probable that the dairy farming sector will beat the intensive livestock farming sector in the cattle manure competition on the manure market. Additional source and effect-oriented measures will be required should the Manure Act prove insufficient for compliance with the Water Framework Directive's targets (even smaller amounts of manure, other manure administration methods, the cultivation of more environmentally-friendly crops, buffer strips, purification, and the discontinuation of the use of agricultural land).

Ammonia Directive
The intensive livestock farming sector is responsible for 45% of the ammonia emissions by the Dutch livestock sector, and will need to make a contribution to the reduction of these emissions, i.e. sty, pen or hen-house measures at all farms, a reduction of the number of livestock, and zoning around Wild Birds and Habitats Directive areas where relocation or new locations are not possible and expansion is possible only as an exception.

Manure processing
The increasing manure disposal charges will exert a significant effect on incomes, and could ultimately result in continuity problems (De Hoop et al., 2004). However, the development of the aforementioned trend could be countered by initiatives in manure processing that remove a proportion of the minerals from the market. From a technological perspective, there are few impediments to manure processing. At present, the greatest problem is the cost price of these systems; these vary between the methods and installations, but in all cases are equal to or in excess of € 10 per m^3 of unprocessed manure. The restriction of ammonia issues will, in relative terms, be less of a problem for the development of the farms as a result of cheaper technologies and the closure of a number of farms.

Negotiability of production rights
The negotiability of production rights (relocatability, coupling to animal categories) will exert a direct influence on the development of the structure of intensive livestock farms. An increased negotiability will increase the opportunities for an improved farm structure, and consequently could result in a strong concentration of farms.

Animal welfare
During the period until 2015, a changeover is expected from battery-cages to free-range systems in the laying-hen sector, and to group pens for pregnant sows. A changeover from cage to free-range systems will result in fewer animals per shed or per square metre. A large number of impediments will obstruct expansions of the shed area, such as the environment, building blocks, etc. (Den Hartog et al., 2004). These will in part be the reason that the EU Directive results in a reduction of the number of laying hens in the Netherlands (Van Horne en Bondt, 2003).

A (draft) Directive focused on a reduction of the number of broilers per m^2 could also in part determine the size of future production.
It should be noted that the Netherlands is making more rapid progress than other EU member states in the changeover from battery cages to other accommodation systems; the Netherlands already has fewer than 50% of all its hens in battery cages. In relative terms, Dutch poultry farmers opt for free-range systems more frequently than for improved cages, as a result of which the Netherlands is gaining a lead in the animal-friendly consumer market.
In the pig farming sector, an increasing national surplus of piglets is forecast as a result of the environmental regulations (pig production rights) and productivity differences between the sow and porker farms. Exports of piglets to Hungary have increased greatly since Hungary joined the EU. However, questions are being raised about the export of live animals, certainly when long-distance transport is involved. This could retard the development of these exports.

9.2.3 Space

The intensive livestock farms have traditionally been concentrated in Brabant and north Limburg (in particular, pig farms) and the Gelderse Valley (poultry farms and veal calf farms) (figure 9.4). In addition, there are also a number of scattered concentration regions in Overijssel. Although intensive livestock farms are not located in regions with the greatest urbanisation pressure, they are nevertheless situated in more urbanised rural regions and/or regions that are currently in great demand for rural housing, business accommodation and/or recreation. Consequently, in the future, diffuse urbanisation will have a pronounced effect on these regions. This will push back the sector further in some regions, and certainly in Brabant and north Limburg; conversely, the current reconstruction process also offers opportunities for innovation and reinforcement.
Spatial pressures in outlying districts play an important role for the Dutch intensive livestock farming complex. Although many farms have virtually no opportunities for further development in their current location, a relocation of these farms to regions that offer more opportunities is usually too costly. Consequently, major shifts in the regional production of Dutch intensive livestock farms are not forecast in the years until 2015. As a result of the current legislation and regulations, farmers planning developments of their farms are confronted with a permit issue procedure that is complex, time-consuming and, on occasion, chaotic (Den Hartog et al., 2004).
The intensive livestock farms are engaged in virtually no diversification activities; fewer than 2% of intensive livestock farms are active in agricultural nature management; large, factory-like buildings do not make a favourable contribution to the landscape, the odour nuisance is an unfavourable factor for recreation, and the pigs/poultry are detrimental to nature (emissions).

Figure 9.4

Intensive livestock farming regions
(based on DSU/ha; the darker the area,
the more DSU/ha)

9.2.4 Technology

The Dutch intensive livestock farming complex is a large-scale production operation that exports the majority of its products. Consequently, the sectors within the complex cannot complete the necessary switch from 'sales' to 'marketing' by an approach involving sales to small-scale niche markets. Added costs do not automatically generate added values.
The farms' customers are highly concentrated, combine their purchasing, and have a strong position in the market; for these reasons, it is difficult for farmers to recoup substantial added costs. Other approaches will need to be adopted to increase revenues or reduce costs. ICT is creating opportunities for revenue and/or cost measures. Consumer-oriented product development is essential for sustainable development; fresh high-quality products offer prospects.
Healthy animals are essential for the achievement of a high production rate per animal. The 'high health status' operating concept, in which animals are free of a number of pathogens, is becoming more common in the pig farming sector. The challenge for the future will be to follow up the healthy start of a farm with the deployment of means and methods that have been proven in practice in ensuring the retention of animal health.

Automation

Robotisation can contribute to an improvement of the quality of labour and a reduction of manual labour effort. Examples of these robots for the pig farming sector are automatic weighing and selection systems for porkers, and cleaning robots. A range of variants of this weighing and selection system are currently in development, and will shortly become available to the sector. This new system will contribute to the selection of pigs of the correct delivery weight for the slaughterhouse, and to the correct confirmation for the slaughterhouse. Consequently, this is an interesting development from both a labour perspective *and* a revenue perspective.

Environmental technology

The pasteurisation of manure by means of fermentation and composting could guarantee the responsible disposal of manure in the Netherlands and abroad. Manure incineration (of poultry manure) could also cut back the manure surplus. In addition, it will also be necessary to restrict emissions of stench, ammonia, greenhouse gases and dust to the atmosphere. Within this context, ingenious, integral hen-house concepts will be required which prevent these emissions and consequently ensure for low costs. The rapid drying and/or removal of manure from the hen-house could be a feasible option that ensures low ammonia, odour and methane emissions. The prevention of the fractionation of organic matter into particles of a weight low enough for them to readily be carried by the air will result in lower dust emissions. This will be of importance to the implementation of large-scale (intensive) livestock operations. After many years of research, the *Hercules* sty is now beginning to be used in

Table 9.3

Breakdown of nominal added value and employment (alu)
in the intensive livestock farming complex in 2003 and 2015

	Added value				Employment			
	2003 € million	%	2015 € million	%	2003 alu	%	2015 alu	%
Intensive livestock farming, total	643	12	683	11	16.723	21	12.149	18
of which: veal farms	58		65		2.259		1.917	
pig farms	360		439		10.621		7.672	
laying-hen farms	115		93		1.748		1.188	
broiler farms	111		86		2.095		1.372	
Processing, total	1.738	33	2.355	40	16.831	21	14.526	21
of which: veal slaughtering	353		547		3.163		3.141	
pig slaughtering	1.048		1.406		9.741		8.376	
poultry slaughtering	337		403		3.927		3.009	
Delivery, total	2.005	38	2.055	34	30.242	39	28.050	41
of which: feed industry	222		226		4.010		3.407	
wholesale	438		450		7.813		7.289	
banks, insurance	387		398		5.433		5.101	
Distribution	855	16	867	15	15.496	20	14.311	21
Intensive livestock farming complex	5.241	100	5.959	100	79.292	0	69.037	100
In % of total agro-complex	22,2		22,1		20,0		19,7	
Export dependency (%)	78		76		79		75	

Source: LEI.

practice. This integral concept devotes additional attention to environmental protection, and also gives consideration to the improvement of animal welfare.

9.3 Prospects

9.3.1 General

The prospects for the sectors in this complex vary from a slight decrease (in the number of broilers) to possibly even a slight increase (veal calves). Economic growth could conceivably result in product prices at a slightly higher level than those usually achieved in past years, although competition from overseas is increasing.

Global competitive relationships are becoming increasingly determinative for the intensive livestock farming complex. The prevailing and forecast WTO policy (with lower import tariffs) is unlikely to result in a decline in the current greatly increased imports of chicken meat from countries outside the EU. Consequently, Dutch broiler production will be unable to return to the level prior to the 2003 outbreak of fowl plague before 2015. However, in comparison with the 2004 production figures, the further decline in this period will be limited. Competition in the global market will increasingly focus on the more expensive portion market (i.e. the market for pork tenderloin, chicken breast, drumsticks, etc.). This will impose pressure on the profitability of the Dutch intensive livestock farming complex. The environmental and spatial planning regulations restrict the sectors' structural development (increases in scale, relocation). In the years since its introduction, the government's 'buy-up scheme' implemented within the scope of the country's manure policy has already resulted in a major part of the necessary reduction in the number of animals. Consequently, during the years up until 2015, the reduction of the intensive livestock farms could be relatively modest in scale, varying from a stable number of pigs to a 10% reduction in the number of poultry. The added value could exhibit a light (nominal) increase in comparison with the level in 2003, a poor year for the sector. This recovery will in part be based on more extensive processing and products tailored to consumer demands (table 9.3). Employment offered by the complex will decline by about 15%. The greatest decline in jobs is expected in the livestock farms and the processing industry. With its export dependency of about 75%, the intensive livestock farming complex will continue to depend greatly on foreign consumers.

The intensive livestock farming complex is engaged in product differentiation on a limited scale that targets a variety of niche markets, such as the organic sector and sales under the ecological seal of approval (De Hoeve). However, notwithstanding the formation of these chains, the lion's share of the intensive livestock farming complex' production is – and will continue to be – marketed in the 'customary' segment.

During the coming years, the size of the veal sector (in terms of the number of animals) could remain unchanged or even increase slightly. However, the sector is greatly dependent on the European slaughter premium (€ 50 per

Figure 9.5

Number of specialised pig farms and average number of pigs per holding, 1980-2015
Source: Statistics Netherlands (CBS), and LEI.

Figure 9.6

Number of specialised poultry farms and average number of birds per holding, 1980-2015
Source: Statistics Netherlands (CBS), and LEI.

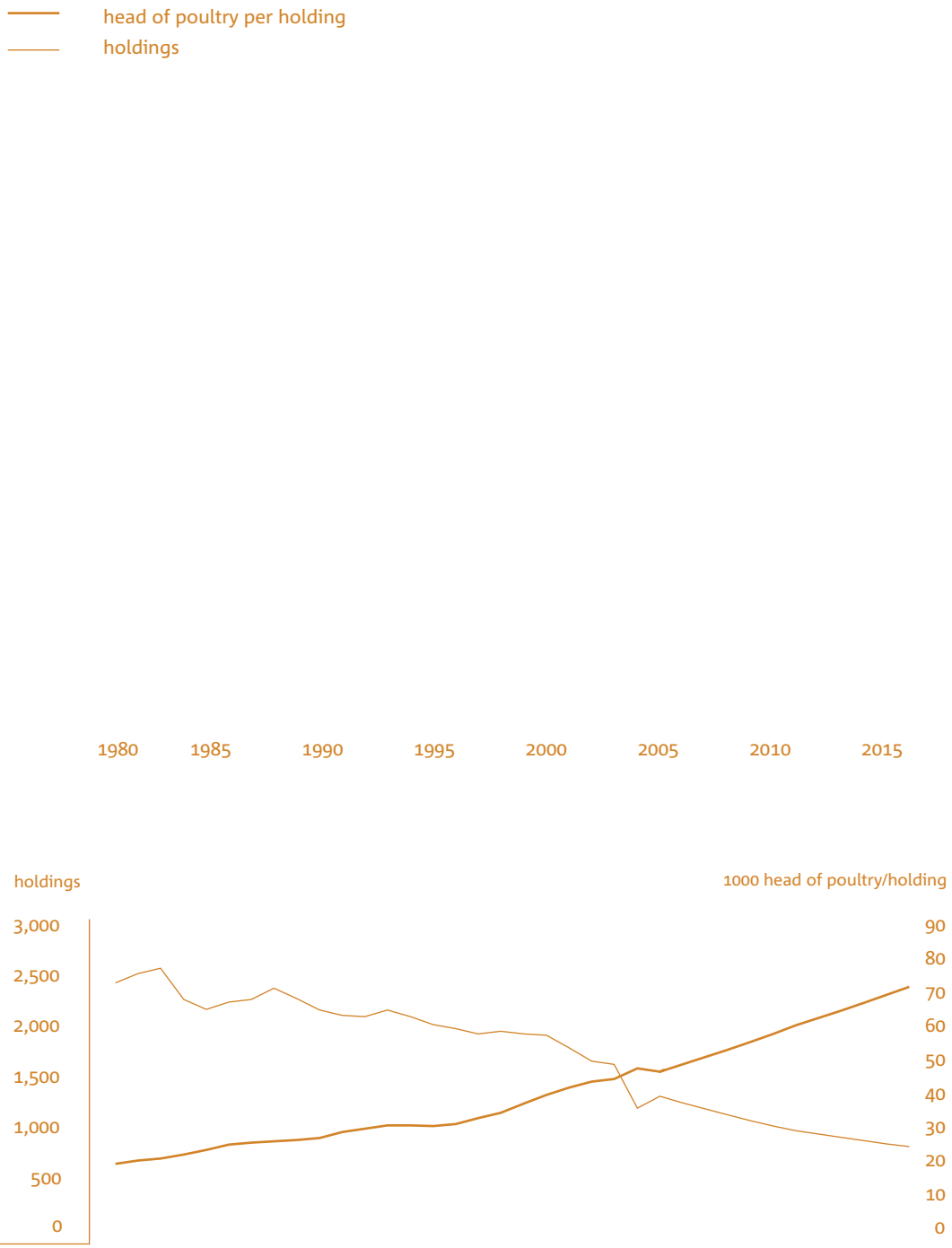
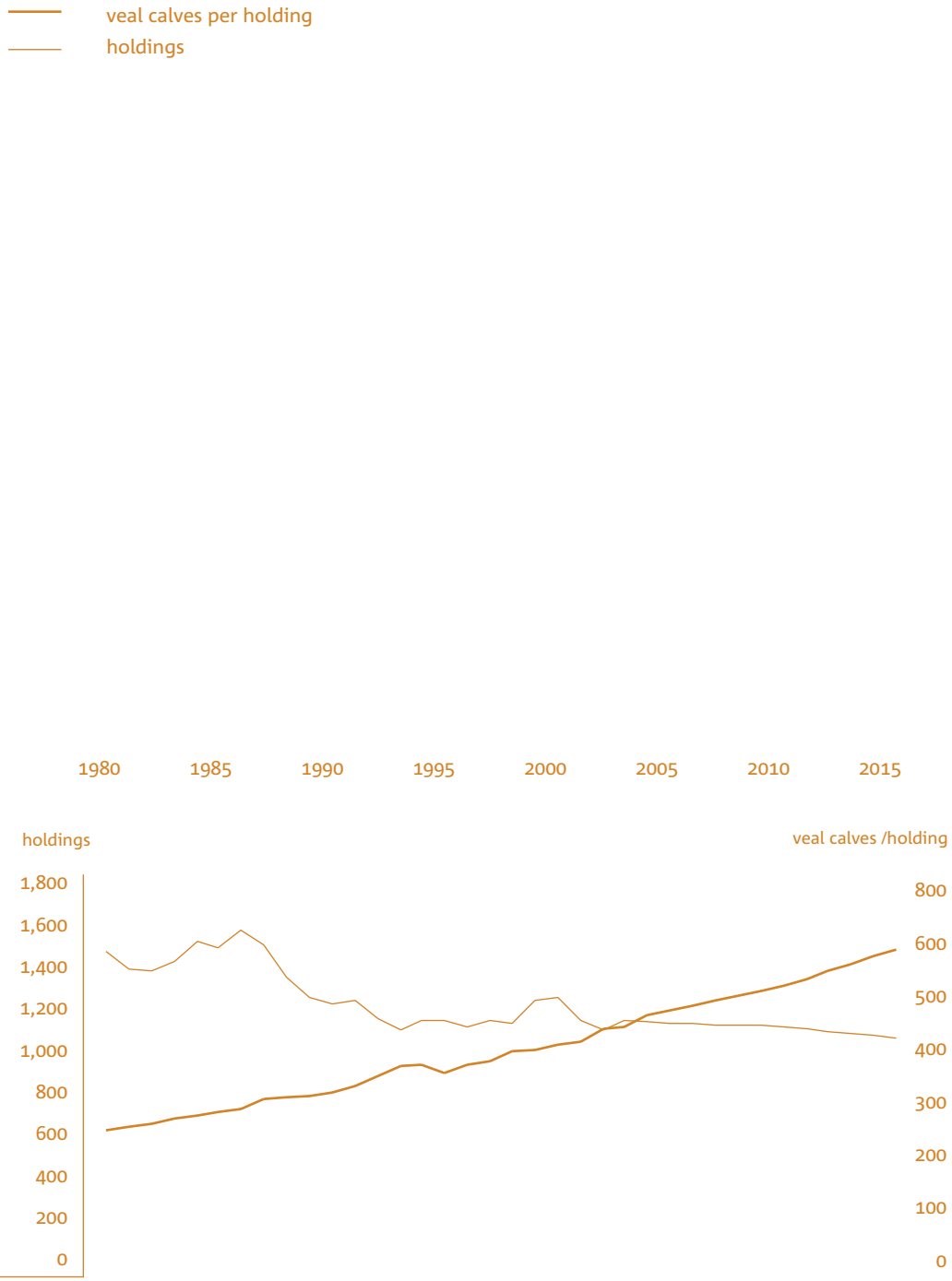


Figure 9.7

Number of specialised veal farms and average number of animals per holding, 1980-2015
Source: Statistics Netherlands (CBS), and LEI.



animal, which is very high in relation to the income), which is currently coupled to the number of animals. A (complete) decoupling could result in a decline in the number of farms and in further increases in the sector's scale. In view of the calf imports, the sector could also be affected by changes in transport regulations.

9.3.2 Holdings

The intensive livestock farming chains are characterised by their narrow average margins. At the same time, the farms exhibit a great variation in profitability. These differences in income are in part the reason for the internal dynamism within the intensive livestock farming complex, whereby the animal production rights of older farmers are taken over by economically viable farms aiming for growth. The adaptive capacity of individual farms depends on their specific situation, i.e. the farmer's age, the succession situation, the assets, the size of the farm, and the regional circumstances. In the past, developments in other agricultural sectors in which farms kept pigs or poultry (in particular, dairy farms) also played a role; however, the increasing specialisation (disappearance of mixed farms) has reduced this influence. Nevertheless, there are still some relationships, in part due to the developments in the manure policy.

One of the challenges confronting the pork chain is the reinforcement of its consumer and retail trade position. This change in focus, currently concentrated on gaining control of food safety and animal health, will require substantial investments. A further challenge confronting the chains is the reduction of losses in the chain; for example, the pork chain could achieve annual savings in excess of € 0.05 per kg (Bondt et al., 2005).

The continuing increases in scale will result in a further decline in the number of farms in the intensive livestock farming complex (figures 9.5, 9.6 and 9.7).

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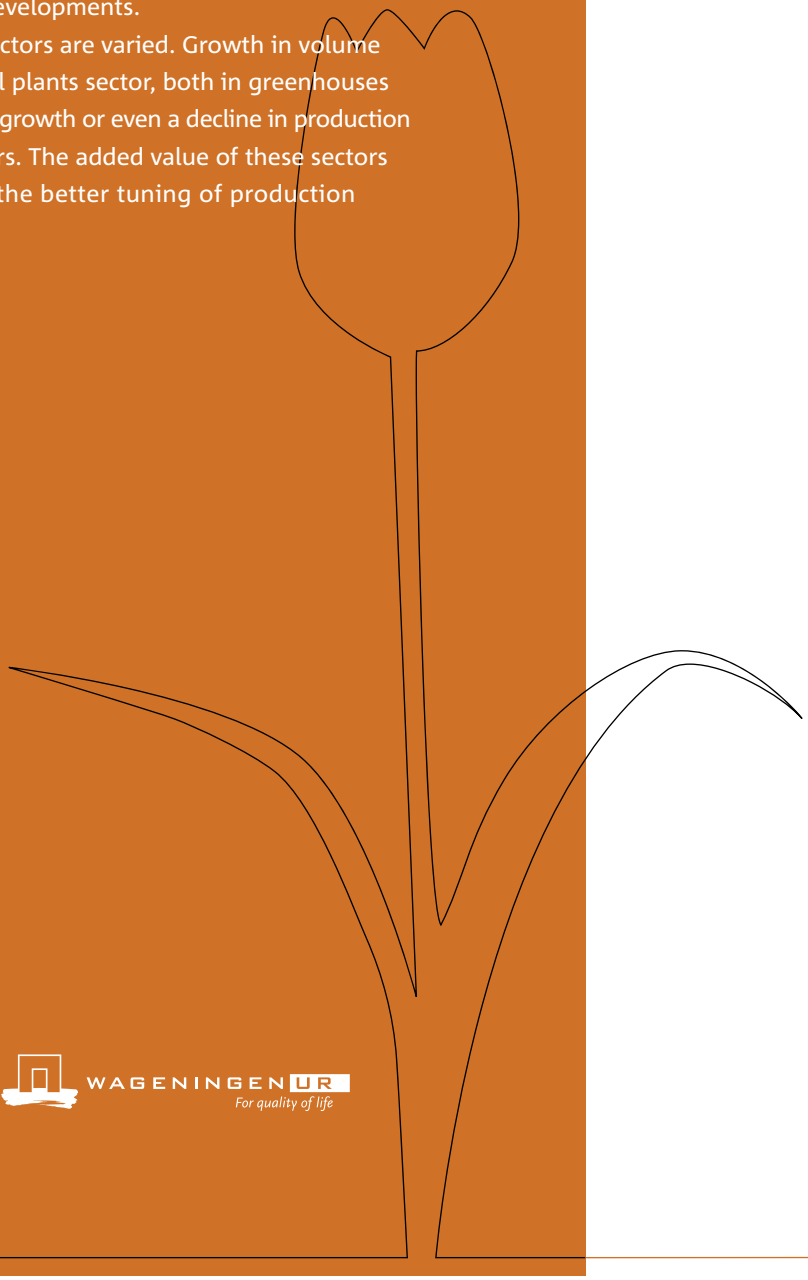
Despite its relatively small surface area, the Netherlands has developed into an agricultural trading nation of some stature. The agricultural sector has a favourable basis, but is confronted with greatly changing circumstances. This is chiefly linked with the globalisation of the economy, the reforms of the European agricultural policy, the limitations of physical and environmental space, and technological developments.

The prospects of the sub-sectors are varied. Growth in volume beckons for the ornamental plants sector, both in greenhouses and outdoors, while limited growth or even a decline in production is predicted for other sectors. The added value of these sectors can still increase through the better tuning of production to demand.



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