Clusters Agriculture

How can clusters in agriculture be measured and identified in the Netherlands?
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M.A. Schouten
Registration number: 890713747040

Economics and Policy (BEB)
Agricultural Economics and Rural Policy Group

Supervisor: prof. dr. W.J.M. Heijman
Second supervisor: dr. J.A.C. van Ophem

Abstract

There are several methods to measure clusters in agribusiness:

- *Shift share analysis*: a method of estimating the competitiveness of a certain area.
- *Location quotient:* a tool to measure economic strength of a certain industry in a region.
- *Clustering based on number of farms.*

Clusters can be identified by type of knowledge:

- Factor endowment clusters: clusters that exist because of comparative advantages.
- Techno clusters: clusters that are based on sharing of knowledge.
- Historic knowhow-based clusters: clusters that exist because of traditional knowhow advantages.

Clusters can be identified by type of development:

- Geographical clusters: clustering because of the location or availability of resources.
- Sectorial clusters: clustering of firms from the same sector.
- Horizontal clusters: clustering of firms on a horizontal level.
- Vertical clusters: clustering of firms from the same supply chain.

Location quotients agriculture in the Netherlands:

According to location quotients calculation (based on number of jobs in agriculture and number of farms) agriculture is overrepresented in the less urbanized and more remote parts of the Netherlands with the exception of horticulture; horticulture is mainly located in the urbanized western part of the Netherlands.

Cluster analysis based on number of farms in the Netherlands:

- Arable farms: mainly located in the provinces Zeeland, Flevoland and Groningen where the soil type is suitable for arable farms.
- Horticulture farms: greenhouse horticulture is clustered in the urbanized western parts of the Netherlands. Horticulture in open ground is mainly located in COROP-areas: *de Kop van Noord-Holland* and *Agglomeration Leiden en Bollenstreek.*
- Sustainable livestock: agriculture of grazing animals is mainly located in the northern and eastern part of the Netherlands, where the price of land is the lowest.
- Intensive livestock: the more intensive form of livestock agriculture (pig, poultry and veal meat production) is mainly located in the eastern part of the Netherlands.

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Chapter 1: Introduction

1.1 Motivation

In various previous courses I attended in the BSc study *Economics and* Policy I repeatedly came across the term cluster, which always has had my interest. In the course *Planning Studio 3: Strategic Planning,* a course that I attended for the specialization *Spatial Planning,* I worked a couple of weeks fulltime with a case concerned with *Agriport A7,* a modern project location for large-scale horticulture. During that course I began to wonder if there were comparable agribusiness clusters in the Netherlands, and why agribusiness clusters exist in the first place.

In this bachelor thesis I had the chance to try to answer several of my own questions. Why do clusters exist? Why do clusters exist in Dutch agriculture? And the main question I try to answer in the conclusion: *How can clusters in agriculture be measured and identified in the Netherlands?*

Because I've attended some spatial planning courses in my bachelor I became interested in making maps myself. Analyzing clusters in agribusiness offered the opportunity to make maps that also were useful and relevant. Those maps offer a quick overview of where in the largest agricultural sectors are mainly clustered in the Netherlands.

1.2 Methodology

In order to provide answers to the mentioned questions I have taken the following steps:

First I will set up a theoretical framework about clusters on which further steps are based. I will continue with researching literature in order to find existing methods of analyzing clusters. Because complete data about agriculture in the Netherlands is scarce I have created my own method of analyzing clusters based on available agriculture data in the Netherlands.

Furthermore I have created maps containing cluster analyses in the Netherlands. The data used in the maps comes from *Centraal Bureau voor de Statistiek (CBS)*; the calculations are all done in spreadsheet application Microsoft Excel; the results from Excel are processed into maps with the application Adobe Photoshop.

Finally I conclude with a focus on Dutch floriculture, this because Dutch floriculture is known worldwide for its size and effectiveness; clustering is a huge influence on Dutch floriculture.

1.3 Content

Chapter 2: Theoretical framework gives a theoretical framework concerning clusters in general and clusters in agriculture. The chapter includes examples of clusters in agriculture, a paragraph about Greenports (Dutch national guidelines for clustering) and a paragraph about cooperatives in agriculture.

Chapter 3: *Cluster identification* is a chapter in which various which different types of cluster identification are described.

Chapter 4: Cluster measurements contains a number of methods of clusters analysis; Shift share analysis, Location Quotients and a method I have created myself based on the up to date available data agriculture in the Netherlands.

Chapter 5: Location Quotients includes maps showing an overview of location quotients, based on both jobs and companies, of the COROP-areas in agriculture.

Chapter 6: Cluster analysis based on number of farms in Dutch agriculture: in this chapter you can find maps showing an overview of clusters based on number of farms in Dutch agriculture per COROP-area.

Chapter 7: Focus on floriculture clusters in the Netherlands: in this chapter I have discussed Dutch floriculture based on previous chapters.

Chapter 8: Conclusion answers the main question of this BSc thesis: *How can clusters in agriculture be measured and identified in the Netherlands?*

Chapter 9: Discussion: what were the stumbling blocks I have come across while writing this thesis? What could I have done better? What are the shortcomings of this research?

Chapter 2: Theoretical framework

2.1 Clusters

Michael Porter was the first to use the term cluster in an economic context. He introduced the term in: *The Competitive Advantage of Nations* (1990). The term cluster is also known as business cluster, industry cluster, competitive cluster or Porterian cluster.

A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. Clusters take varying forms depending on their depth and sophistication, but most include end-product or service companies; suppliers of specialized inputs, components, machinery, and services; financial institutions, and firms in related industries (Porter, 1990).

Economy of Agglomeration is also a term that is used to describe this phenomenon. *Economies of Scale* and the *Network Effect* are related concepts. **Economy of Scale:** costs decrease when company size increases. **Network Effect:** the value of a product or service increases when it is used more. Online social media such as Facebook and Twitter can be seen as modern examples of the network effect.

Scaling up leads to lower costs per unit produced because of lower transport costs, competing suppliers and specialization. When competing firms are clustering together there can also be positive effects; clusters attract more customers than a single company can attract.

There are two types of advantage that can be gained when scaling up (Silvis ea., 2002).

- Economies of scale on **location** level: maximize profits by producing on a large-scale on one location. For capital intensive products, such as the sugar-industry, it is important to cluster the production physically.
- Economies of scale on **company** level: scaling up of intangibles like management, organization, knowledge, experience and trademarks. This gets more important when the product portfolio of a company gets bigger.

2.2 Agriculture clusters in the Netherlands

The Dutch agribusiness has changed in the last few decades. There has been a continuous process of scaling up. The scaling up mainly was location based; concentration of the production process. The presence of many cooperatives between suppliers and processors within the agricultural industry stimulated the concentration process (Silvis ea., 2002).

Economies of scale were obtained by business growth and the acquisitions or merging of companies. In most cases investments were made in physical inputs like buildings and machines. Innovations were an important part of the concentration process. For instance: the introduction of milk tanks in the seventies; easier transportation of milk from farm to factory.

In 1950 there were about 500 dairy factories while in 1998 there were only 71 factories owned by 15 companies. In 2008 the two largest dairy cooperatives, Royal Friesland Foods and Campina GmbH, merged into FrieslandCampina; one of the largest dairy companies in the world.

Transportations on larger distance became possible; as a result the frequency of milk collections could decrease, so the clustering of companies became easier (Silvis ea., 2002).

The Dutch agribusiness is largely based on international trade. Internationalization is a growth strategy; when the home market is saturated companies can expand in the countries abroad. Because the Dutch market is relatively small especially Dutch companies are international oriented (Silvis ea., 2002).

To be able to compete abroad the products have to be unique or innovative. This is in order to cope with higher costs, transportation difficulties, cultural differences and lack of knowledge about the abroad market (Silvis ea., 2002). With the clustering of companies in the agribusiness knowledge and expertise can be shared among companies, costs can be decreased and transportation can be done on a larger scale level. These three cluster effects increase the competiveness of Dutch agribusiness on an international level.

Many products used in the agribusiness are prone to decay; fresh products have to be distributed to the consumer. Also fresh products that serve as input in the food- and luxury goods industry have to be distributed as fast as possible to the processors. Clustering of input suppliers and processors will lead to minimal transportation difficulties.

Contract Farming: the transaction between growers and buyers is agreed on terms of *what* to be produced (product and quality attributes) and *what* are the commitments for future sale (timing, location and price), according to Minot (1986). R. Mighel adds the provision of farming inputs to the former contract type; beyond specifying what to produce and what the conditions for marketing are, in-kind credit is offered via the provision of key inputs, often with cost recovery upon farm product delivery. L. Jones (1963) adds: under production management contracts growers agree to follow precise technological guidance on *how* to produce (C.A.B. Silva, 2005).

In general *contract farming* is a form of supply chain governance. Firms, in the agribusiness often supermarkets, can achieve secure access to agriculture products, raw materials and supplies meeting desired quality, quantity, location and timing specifications (C.A.B. Silva, 2005).

2.3 Cooperatives in the Netherlands

In agribusiness agriculture cooperatives are pretty common. These agricultural cooperatives are services mainly intended to serve their own members. The goals of these cooperatives are:

- Getting the members of the cooperative the highest income as possible.
- Supply of business supplies for lowest possible costs.
- Achieving economies of scale; the reduction of costs per unit produced.
- Getting more market power.

The amount of cooperatives depends on three things (Silvis ea., 2002):

- Structure of the market: the more a market differs from being a full competition market the higher the chances are that a cooperative will be developed; when a large company, or another cooperative, is dominating a market a countervailing power cooperative is needed to compete.

- The characteristics of the market: in a sector where a lot of decay prone products or bulk products are being used the tendency for working in cooperatives is higher.
- Importance of the product for the farmer's income: tendency for creating cooperatives for important products is higher than for products that don't contribute much to the income.

There are five types of cooperatives (Silvis ea., 2002):

- **Acquisition**: the first cooperatives were based on the purchasing of fertilizer products; when farmers bought fertilizer together they could get bulk discount. Nowadays cooperatives also deal with the acquisition of other business supplies.
- **Marketing**: auctioning of products; buyers of the products are guaranteed quality and sellers are guaranteed payment (FloraHolland is an example).
- **Processing**: started with the processing in factories instead of on the farm; in the Netherlands *FrieslandCampina* is the only large dairy cooperative.
- **Credit**: banks for farmers to escape from strongly fluctuating rates; the *Rabobank* in the Netherlands started as a bank for farmers.
- **Services**: cooperatives that support farmers with services like accounting and insurances.

In the Netherlands two large credit cooperatives were founded: the Coöperative Boerenleenbank and the Coöperatieve Centrale Raiffeisenbank. In 1972 these two cooperatives merged together: the Rabobank.

In every Dutch sector within the agriculture and horticulture there has been a process of scaling up. Local cooperatives started working together on regional levels, eventually cooperatives started merging on national level (Silvis ea., 2002).

2.4 Greenports

In the paper: *Clusters in Agribusiness: the Case of Flowers in the Netherlands* written by Michel Dignum he concludes that Greenports have all the fundamentals for being a cluster (M. Dignum, 2005).

The term Greenport is introduced in the *Nota Ruimte* in 2004 by the *Ministry of Housing, Spatial Planning and the Environment (VROM).* Greenports are based on the term *Mainport*, used for the harbor of Rotterdam and for Schiphol. The government aims to cluster capital intensive and knowledge-intensive *horticulture* in five Greenports (VROM, 2004).

Within Greenports primarily production, processing, trade and distribution are coordinated; mainly non-land-based and capital-intensive forms of gardening (horticulture, permanent crops and bulbs pot and container production). National policy focuses on developing Greenports in such a way that their function as Greenport will be strengthened and preserved (E. Annevelink, 2006).

The core tasks of Greenports are:

- Innovate more quickly than international competition.
- Become, or stay, the international leader as service provider or director of product flows.
- Keep the prominent production of primary goods in the Netherlands.

To achieve these goals clustering, accessibility and proper management are necessary (E. Annevelink, 2006).

A good connection between the Greenports and the Mainports, the harbor of Rotterdam and airport Schiphol is crucial. The connection is needed for imports, exports and supply on international level; Mainports also give access to multimodal networks. Certain product groups rely more on the need of the availability of Mainports than other product groups.

A good accessibility of the Greenports is needed to maintain the *Gateway to Europe* function the Dutch agribusiness currently has. It will be a challenge to cope with transportation problems, such as congestion, in the future, because it is expected that the amount of services in the market (responsiveness, assortment, quality) will grow (E. Annevelink, 2006).

2.5 Examples of agriculture clusters in the Netherlands

This chapter contains short descriptions of clusters in the agriculture in the Netherlands.

Aalsmeer

Aalsmeer is one of the five Greenports in the Netherlands. *Aalsmeer* is known for its floriculture, especially the auctioning of flowers. The flower auction building, the *Aalsmeer Flower Auction,* is one of the largest commercial buildings in the entire world (in terms of floor space); the auction is run by *FloraHolland*.

A Dutch Auction is used in this flower auction. The auctioneer starts with a high price and gradually lowers it by steps until someone is willing to buy the item. In practice the “auctioneer’’ is often a mechanical device like a dial with a pointer which rotates to lower and lower values as the auction progresses. Dutch auctions can proceed very rapidly, which is one of their brief virtues (Hal R. Varian, 2006).

Agriport A7

Agriport A7 is a modern agribusiness park; mainly large modern greenhouses. The cluster is located directly to the highway A7 in North Holland close to Amsterdam. Entrepreneurs are currently developing this business park. Large plots are available for businesses that need room.

Companies in Agriport A7 share a fiber network connection. It is possible for businesses to mutually share residuals, basically certain quantities left over at the end of a process such as heat, residual water and CO2. This is not only sustainable but can also decrease costs and improve the competitive situation of local businesses. Sharing logistics is also one of the agglomeration benefits of Agriport A7 (Agriport A7, 2011).

Bollenstreek & the Northern Bollenstreek

The *Bollenstreek* is also one of the five Greenports. It’s a region in North and South Holland specialized in the cultivation of bulbs. The *Bollenstreek* is famous for its colorful flower fields. *De Keukenhof,* world’s largest flower garden, is part of the *Bollenstreek*. In the province North-Holland (*de Kop van Noord-Holland)* is the region: *Northern Bollenstreek* located. Due to urbanization of the

Bollenstreek a lot of bulb cultivators move from the *Bollenstreek* to the *Northern Bollenstreek* where land is cheaper and relatively abundant.

Bulb cultivation depletes the quality of the soil; bulbs need a 'fresh' lot of land for optimal cultivation. In order to achieve optimal cultivation a traditional phenomenon is still taking place in the *Northern Bollenstreek*; '*de reizende bollenkraam'.* It means that the businesses that cultivate bulbs rent a different plot of land from other agriculture businesses each year (a lot that hasn't been used for bulb cultivation for a few previous years). The farmer that rents out the land helps with the bulb cultivation (CBS, 2011).

Boskoop

Boskoop, a region in South Holland, is another Greenport. It's an international center for arboriculture; a cluster of production, trade, logistics, supply, services, knowledge and education.

The foundation *Stichting Greenport Regio Boskoop* has a leading role and aims to organize within Greenport *Boskoop*, the foundation initiates, coordinates and represent all stakeholders. Its goal is to strengthen the arboriculture in *Boskoop* and to maintain a balance between economic activities and other aspects such as nature conservation, living and recreation (Greenport Regio Boskoop, 2008).

Fruitpact

The *Fruitpact* is a collaboration between government and agribusiness in the region *Rivierenland*. Fruit cultivation is the most important agriculture related industry in the mentioned region. The main goal of the collaboration is to strengthen the competitive position of the fruit cultivation related cluster. Other goals are achieving social and ecological sustainability in the region.

The government and businesses can reach their goals by working together on local production, trade, processing, services and logistics (Fruitpact, 2011).

Seed Valley

Seed Valley is an international center for plant breeding and seed technology. The High-Tec cluster is situated in North-Holland. Multiple innovative companies are part of Seed Valley. Development company: *Ontwikkelingsbedrijf Noord-Holland Noord* has a leading role in the development of the cluster.

The main goal of the cooperation is similar to the other clusters; to strengthen its economic position on the world market. Seed Valley hopes to achieve this by investing on its image, attracting high skilled workers, stimulating innovation and sharing knowledge and expertise (Seed Valley, 2011).

Venlo

Greenport Venlo is the second largest horticulture cluster in the Netherlands. The growth of the cluster is mainly due to the strategic location near Germany. Similar to the other clusters this cluster is a collaboration between businesses, entrepreneurs, the government, researchers and education (Greenport Venlo, 2011).

Some of the goals *Greenport Venlo* has:

- Stimulating innovation and knowledge level.
- Making production more sustainable.
- Strengthening of the cluster.
- Stimulating collaboration with German state North Rhine-Westphalia.

Westland

Het Westland is a region in the province of South Holland. The Region is known for its horticulture. At night an orange glow, coming from assimilation lighting from the greenhouses, lights up the whole sky. The region is also called the *Glazen Stad* which stands for *Glass City* in Dutch thanks to the enormous amount of greenhouses located closely together.

With over 2,500 acres of greenhouses Westland is the largest single greenhouse area in the world. About 80% of the business located in the region is related directly or indirectly to the horticulture. About 50,000 people are employed in the Westland (Gemeente Westland, 2011).

Westport is designated as one of the five Greenports in the Netherlands by VROM. In *Visie Greenport Westland 2020,* a vision about the region made by the municipality, six main goals are described:

- Strengthening the horticulture cluster.
- Strengthening of the villages.
- Meet the housing needs.
- Improve the physical accessibility.
- Solving water problems.
- Establishment of ecological links and zones.

The municipality Westland wants to collaborate with other governments, businesses and other stakeholders to the benefit of the horticulture cluster (Gemeente Westland, 2011).

2.6 Determinants of National Competitive Advantage

Michael Porter uses a diamond shaped diagram to illustrate the Determinants of National Competitive Advantage. All of the four points on the diagram are essential ingredients for international competitive success but clusters with only one of the four elements also exist (Michael Porter, 1990). The same principle can also be used for regions, not only nations.

Figure 1: Determinants of National Competitive Advantage

Determinants of National Competitive Advantage:

- **Factor Conditions**: technology, labor and infrastructure (and other conditions) needed in order to be able to compete in a certain industry.
  Examples: highly skilled workforce, a lot of raw materials available.
- **Demand Conditions**: the size and character of the home-market influence the growth, innovation and quality of the produced goods.
  Example: high performing cars relatively popular in Germany due to presence of the Autobahn.
- **Related and Supporting Industries**: the presence of related and supporting industries, clusters of industries provide more effective and innovative inputs.
  Example: Silicon Valley, a lot of High-Tech businesses located close to each other.
- **Firm Strategy, Structure and Rivalry**: the conditions of a nation or region influence the way that companies are organized and managed.
  Example: there are nine large competitors in the Japanese automobile industry; therefore, there is a lot of competition.

2.7 Clusters and competiveness

Clusters influence competition in three ways: increasing *static productivity,* increasing *capacity for innovation* and the stimulation of *new business formations (*M. Porter, 2000).

Static Productivity:

- ***Access to specialized inputs and employees*:** companies located within a cluster have access to specialized inputs such as machinery, services and employees that are superior or have lower costs compared to input alternatives from distant locations. The presence of a cluster does not only increase demand for certain inputs but also increases the supply (M. Porter, 2000). Competition of supply increases the quality of the supply of inputs.
- ***Access to information and knowledge:*** knowledge about the market, technical knowledge and specialized knowledge accumulates within a cluster. This can be accessed best and at lowest costs from within the cluster. Also the existence of personal relationships and community ties that arises in clusters fosters trust and stimulates the flow of information. Important knowledge is knowledge about buyer needs; when buyers and sellers are both part of the cluster that information is available. This information benefits everyone that is part of a particular cluster (M. Porter, 2000).
- ***Complementarities**:* a cluster enhances productivity by facilitating complementarities between activities of cluster participants. When a part of a cluster performs badly it negatively influences the performance of the rest of the cluster. Marketing is a form of complementarity; a group of related firms and industries can efficiently work together in joint marketing. It can also enhance the reputation of a certain location or field (M. Porter, 2000).
- ***Access to institutions and public goods**:* firms can benefit from local public goods such as infrastructure or benefit from locally situated institutions at low costs. Knowledge is a quasi-public good (M. Porter, 2000).
- ***Incentives and performance measurement:*** clusters can give incentives to improve productivity or efficiency of firms; competitiveness is the main incentive. Clusters also facilitate performance measurements; there are opportunities to compare performances with similar firms. For instance: comparing the employee performances of similar firms (M. Porter, 2000).

Capacity for innovation:

Firms in clusters have clear information about the buyer's needs because of knowledge en relationships, as mentioned earlier. Cluster participants learn early about technology changes and technical possibilities, so the opportunities for innovation are great. Another advantage for clustering is the possibility to innovate rapidly because firms supplying input are likely located closely.

Competiveness stimulates innovation; when a firm innovates a rival firm probably cannot stay behind. Firms that are isolated from a cluster are less likely to innovate (M. Porter, 2000).

Clusters and new business formation:

Many new businesses are formed within in clusters rather than individually on isolated locations. There are a number of reasons why this happens:

- Clusters provide incentives for entry of a market because of information about opportunities.
- The existence of a cluster itself indicates opportunity.
- People working in or near a cluster more easily percept gaps in products, services or suppliers to fill; these individuals are more likely to start new firms to fill those gaps.
- Lower barriers: assets, inputs, services, staff and skills required are often available at the cluster location. The lower barriers do not only apply to new firms but also to existing firms that might relocate to the cluster location.

(M. Porter, 2000).

Chapter 3: Cluster identification

3.1 Clusters identified by kind of knowledge

There are three types of clusters that can be identified by different kinds of knowledge (Porter, 1990).

- **Factor Endowment clusters**: some countries/regions have comparative advantages due to the presence of certain factor endowments. This is basically the amount of land, natural resources, labor and population size available in a nation or region (Michael Porter, 1990). Business clusters will likely be formed in areas where the companies can achieve comparative advantages due to geographical position. For instance in *De Bollenstreek,* a region in the Netherlands, a lot of bulb cultivation companies are clustered. This because the local climate is very suitable for bulb cultivation.
- **Techno clusters**: clusters of high technologically orientated businesses. Sharing knowledge is important in techno clusters. This type of cluster very often is linked to universities and research centers. In the Silicon Valley area there are more than 20 universities, including Stanford University. Wageningen UR also is a techno cluster, mainly focused on the domain of food and living environment.
- **Historic knowhow-based clusters:** clusters based on traditional, sometimes for multiple centuries, activities with know-how advantages. For instance the financial center in London, world's greatest foreign exchange market (Triennial Central Bank Survey, 2007).

3.2 Clusters identified by form of development

There are four types of clusters that can be identified by different forms of development:

- **Geographical clusters:** clusters that exist because of geographical reason; a location where a certain type resources are available attract firms that process that type of resources.
- **Horizontal clusters:** interconnections between businesses on a horizontal level; sharing resources and knowledge.
- **Vertical clusters:** interconnection between businesses on a vertical level; supply chain clustering.
- **Sectorial clusters:** a cluster of firms operating together from within the same sector. Interconnection can occur horizontally and vertically.

Chapter 4: Cluster measurements

4.1 How can clusters be measured?

There is no standard method of identifying, defining or describing a cluster. All cluster analysis is based on local and regional employment statistics in various industrial categorizations. There are two notable databases providing data on clusters and industrial agglomeration:

The *Cluster Mapping Project* (for the USA), conducted by the Institute for Strategy and Competitiveness at Harvard Business School; The Cluster Mapping Project has assembled a detailed picture of the location and performance of industries in the United States, with a special focus on the linkages or externalities across industries that give rise to clusters (Institute for Strategy and Competitiveness, 2011).

The *European Cluster Observatory* (for Europe), managed by the Center for Strategy and Competitiveness at the Stockholm School of Economics; The European Cluster Observatory is a platform that provides a single access point to information and analysis of clusters and cluster policy in Europe. The Observatory provides data and analysis on clusters and competitiveness, a cluster library, and a classroom for cluster education. The Observatory is aimed at three main target groups:

- Policy makers and government officials at the European, national, regional and local levels.
- Cluster management staff.
- Academics and researchers.

The European Cluster Observatory also produces analysis and reports on regional competitiveness conditions, transnational cluster networks, clusters in emerging industries and studies on better practices in cluster organizations (European Cluster Observatory, 2011).

In this thesis I mainly use COROP-areas to compare economic activity per sector. COROP-areas are a regional level between provinces and municipalities. The Netherlands is divided into 40 COROP-areas that consist of several adjacent municipalities. COROP is short for *'COördinatiecommissie Regionaal OnderzoeksProgramma'* which means: coordinating committee regional research program. The committee designed the COROP-areas in 1971 (CBS, 2011).

4.2 Shift share analysis

This tool is widely used to analyze the competitiveness of a certain area. The effect of changes in employment and the associated competitiveness are calculated in order to identify the source of competitiveness for regions (Heijman, 2008). The *shift share analysis* can identify industries that have a comparative advantage in a region.

- *Actual total shift*: change in employment per sector on the regional level relative to the change in employment per sector on the national level.
  $= \sum_1 w_{ijt} - \frac{W_t}{W_0} \sum_1 W_{ij0}$
- *Relative actual shift (RAS)*: total economy growth factor in employment and relating this to the employment development of the region. It indicates if a region has faster or slower

growth in employment compared to the total economy.

RAS = $\frac{\sum_1 w_{ijt} - \frac{W_t}{W_0} \sum_1 W_{ij0}}{W_{ij0}}$

- *Relative proportionality shift (RPS):* explains how the industrial structure of the regional or national economy contributes to the overall employment growth.

  RPS = $\frac{\sum_1 \frac{W_{it}}{W_{i0}} W_{ij0} - \sum_1 W_{ij0}}{W_{ij0}}$

- *Relative differential shift (RDS):* indicates how firms in a region perform relative to national averages for firms in the same sector.

  RDS = $\frac{\sum_1 (w_{ijt} - \frac{W_{it}}{W_{i0}} W_{ij0})}{W_{ij0}}$

In the equations above the following is true:

- W_{ij0} = Employment sector i in region j in year 0.
- w_{ijt} = Employment sector i in region j in year t.
- W_{i0} = Employment per sector i total economic area in year 0.
- W_{it} = Employment per sector i total economic area in year t.

(Heijman, 2008)

4.3 Location quotient:

Another tool to measure the economic strength of a certain industry in a region is the *location quotient technique*; it's a calculated ratio that describes the regional share of an economic activity in a particular industry compared to the national share of economic activity in that industry. The tool is used to identify specializations in a local economy.

Suppose you want to compare employment in region J to the national employment:

- E_i^j = employment in activity i in region J.
- E_i = employment in activity i in the nation.
- E^j = total employment in region J.
- E = total employment in the nation.

The *location quotient* ratio will be (W. Isard, 1998):

$$LQ = \frac{E_i^j \,/\, E_i}{E^j \,/\, E}$$

An equivalent formula to calculate the *location quotient* is:

$$LQ = \frac{E_i^j \,/\, E^j}{E_i \,/\, E}$$

Analysts may want certain information about a region:

- What industry the region has and what industry the region does not have.

- If the regional industry is under- or overrepresented in the region compared to the national economy.
- In what extend can the region's imports of goods and services can be reduced by production within its area.
- In what extend can the region's output of exports be expanded by export trade enhancements.

Background information about the previous can be provided by use of the *location quotient technique.* Comparison of regions is also possible because of this tool (W. Isard, 1998).

A location quotient is equal to the relative share of the (agricultural) sector in the total added value of a region (mainly province or COROP-area) divided by the relative share of the sector in the total national added value. A location quotient under 1 means that a region is not specialized, a location quotient above 1 means the opposite; a region is specialized in the certain activity (Heijman, 2002).

I created maps of location quotients of the four biggest agricultural sectors in the Netherlands; they can be seen in chapter 4 of this thesis. I did not only use information about employment but also I also used data about the number of companies in agriculture.

4.4 Clusters based on number of farms

Another way to analyze clustering is by comparing the number of farms of a certain sector within a number of regions. A large number of companies of a sector in a region can indicate clusters of that agricultural sector in that region.

A method to compare regions better is by dividing the number of companies per sector in that region by the national number of companies in that sector. Multiplying that number by 100 gives percentages.

$$\frac{Cj}{C}\ x100$$

- Cj = Number of farms of a sector in region J.
- C = Number of farms of a sector in nation.

In Chapter 5 maps of the number of farms of the four largest agricultural sectors (agriculture, horticulture, grazing animal farms and housed animal farms) per COROP-area are given. In the same chapter maps containing the shares of number of farms per COROP-area of the national number of farms are given; the same four sectors have been used.

Chapter 5: Location quotients agriculture in the Netherlands

This chapter contains maps giving location quotients based on employment (agriculture, forestry and fisheries) and number of companies (total economic activity agriculture). All calculations for creating data used in the maps were made in Excel. The data used in calculations is provided by CBS.

5.1 Location Quotients based on jobs

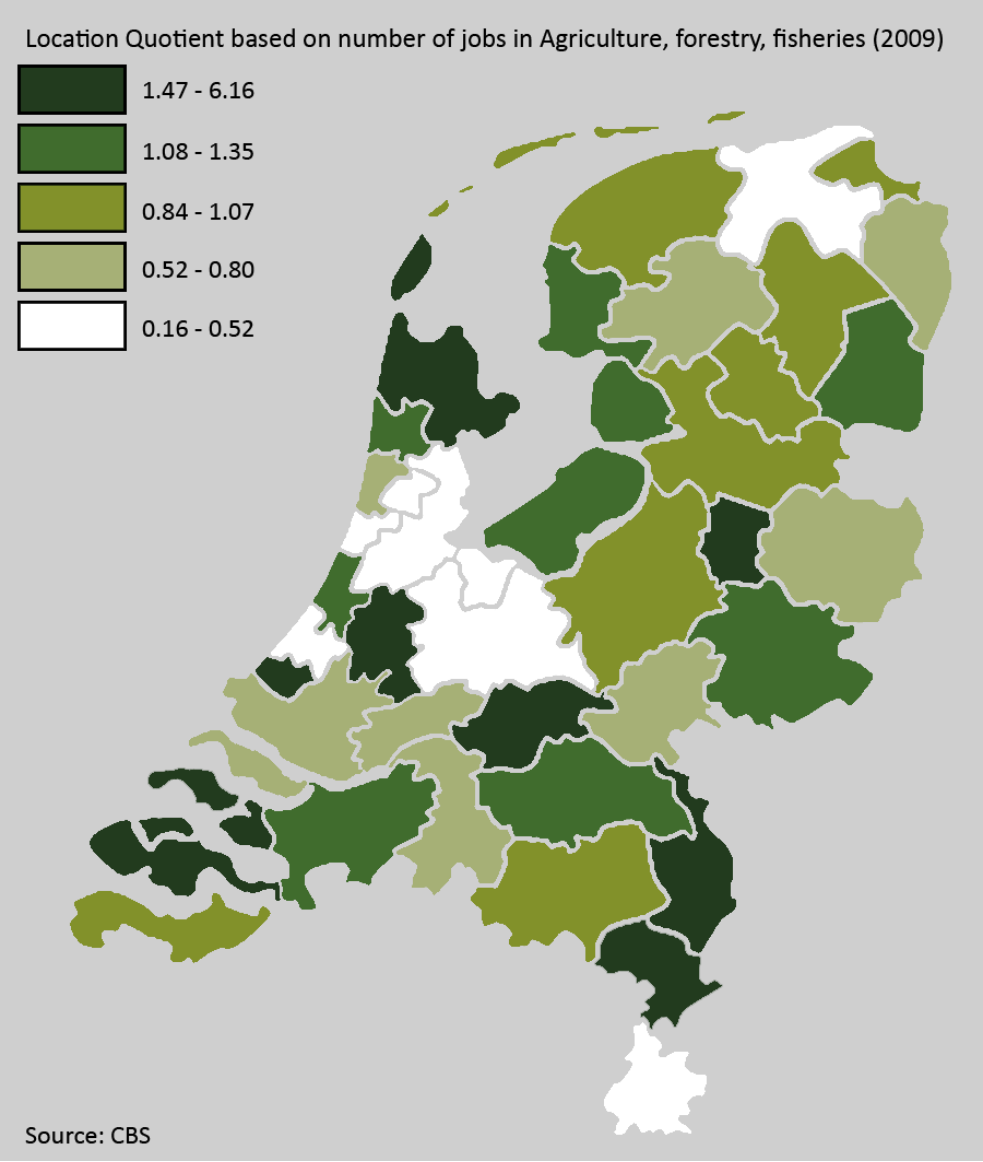

Figure 2: location quotients based on number of jobs in agriculture, forestry and fisheries (2009)

The COROP-area where by far the biggest share of total employment is working in agriculture, forestry or fisheries is 'Delft en Westland'. The area is known for its intensive horticulture, also mentioned in chapter 1.5. See the Annex part C for the complete list of location quotients.

$$\text{Location quotient jobs Delft en Westland} = \frac{E_i^j \,/\, E_i}{E^j \,/\, E} = \frac{10{,}2 \,/\, 111{,}9}{115{,}3 \,/\, 7788{,}6} = 6{,}16$$

- E_i^j = Number of jobs in agriculture, forestry or fisheries in COROP-area (x 1000).

- E_i = Number of jobs in agriculture, forestry or fisheries in the Netherlands (x 1000).
- E^j = Total number of jobs in a COROP-area (x 1000).
- E = Total number of jobs in the Netherlands (x 1000).

Figure 3: location quotients (<1<) based on number of jobs in agriculture, forestry and fisheries (2009)

The darker shade of green shows the COROP-areas with a location quotient higher than 1. It is quite clear that, based on employment within agriculture, forestry and fisheries, the less urbanized COROP-areas in the Netherlands are specialized in agriculture.

Exceptions are the COROP-areas: *Delft en Westland, Agglomeratie Leiden en Bollenstreek en Oost-Zuid-Holland***.** In these three areas located in the more urbanized western part of the Netherlands a relative large share of total employment is working in agriculture, forestry or fisheries sectors. This is mainly due to the large amount of horticulture companies clustered in these regions (see chapter 4.2).

5.2 Location Quotients based on companies

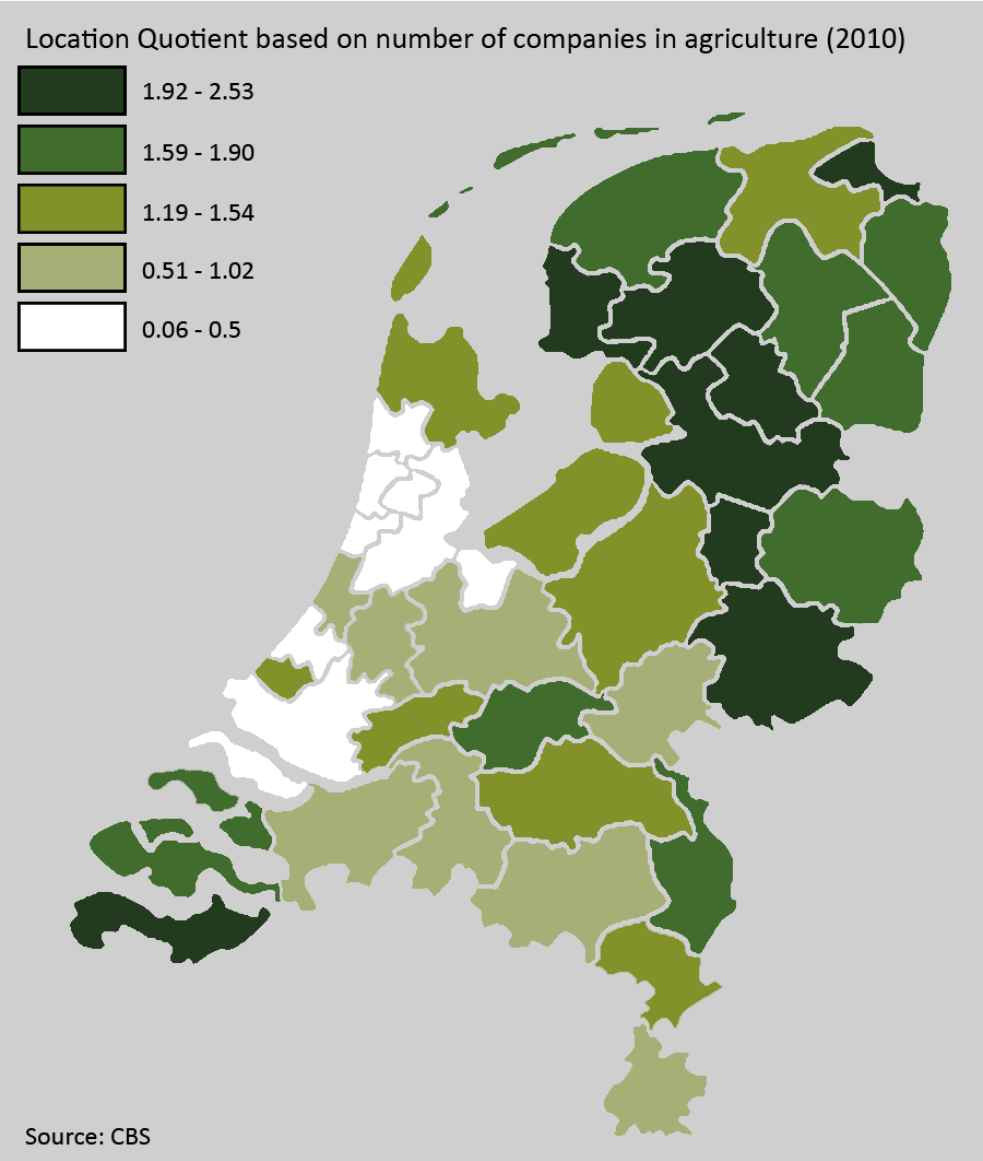

Figure 4: location quotients based on number farms in agriculture (2010)

The location quotient based on number of farms per COROP-area compared to the number of farms in the total Dutch agricomplex is, not surprisingly, comparable with the location quotient based on employment. The less urbanized, mainly the eastern and northern part of the Netherlands, have higher location quotients. However the data can be influenced by the average company size.

Three of the most remote COROP-areas (remote from 'de Randstad'), have the highest location quotients: *Zeeuwsch-Vlaanderen* (2.53), *Achterhoek* (2.23) and *Delfzijl en Omgeving* (2.13). See the Annex part C for the complete list of location quotients.

$$\text{Location quotient companies Zeeuwsch} - \text{Vlaanderen} = \frac{C_i^j \,/\, C_i}{C^j \,/\, C} = \frac{1390 \,/\, 83355}{6310 \,/\, 956210} = 2{,}53$$

- C_i^j = Number of companies in agriculture in COROP-area (x 1000).
- C_i = Number of companies in agriculture in the Netherlands (x 1000).

- C^j = Total number of companies in a COROP-area (x 1000).
- C = Total number of companies in the Netherlands (x 1000).

Figure 5: location quotients (<1<) based on number farms in agriculture (2010)

The image above strengthens the rule that in general the less urbanized en more remote COROP-areas are more specialized in agriculture (based on number of companies in the agricomplex).

Just as in the employment location quotient there are exceptions; *Delft en Westland* and *Zuid-Oost Holland* are the only two COROP-areas in 'de Randstad' with a location quotient above 1. Again the presence of intensive horticulture results in a higher location quotient than the surrounding adjacent COROP-areas.

Chapter 6: Cluster analysis based on number of farms in Dutch agriculture

This chapter contains maps of cluster analysis of the four biggest sectors in the Dutch agriculture based on number of farms (also compared to national levels, expressed in percentages).

- Arable farms: mainly products like potatoes, cereals and sugar beets.
- Horticulture companies: mainly intensive production of vegetables, fruit and flowers.
- Grazing animal farms: mainly cows and sheep in the Netherlands.
- Housed animal farms: mainly chicken, pigs and calves for veal production.

All calculations for creating data used in the maps are done in Excel. The data used in calculations is provided by CBS.

6.1 Agriculture

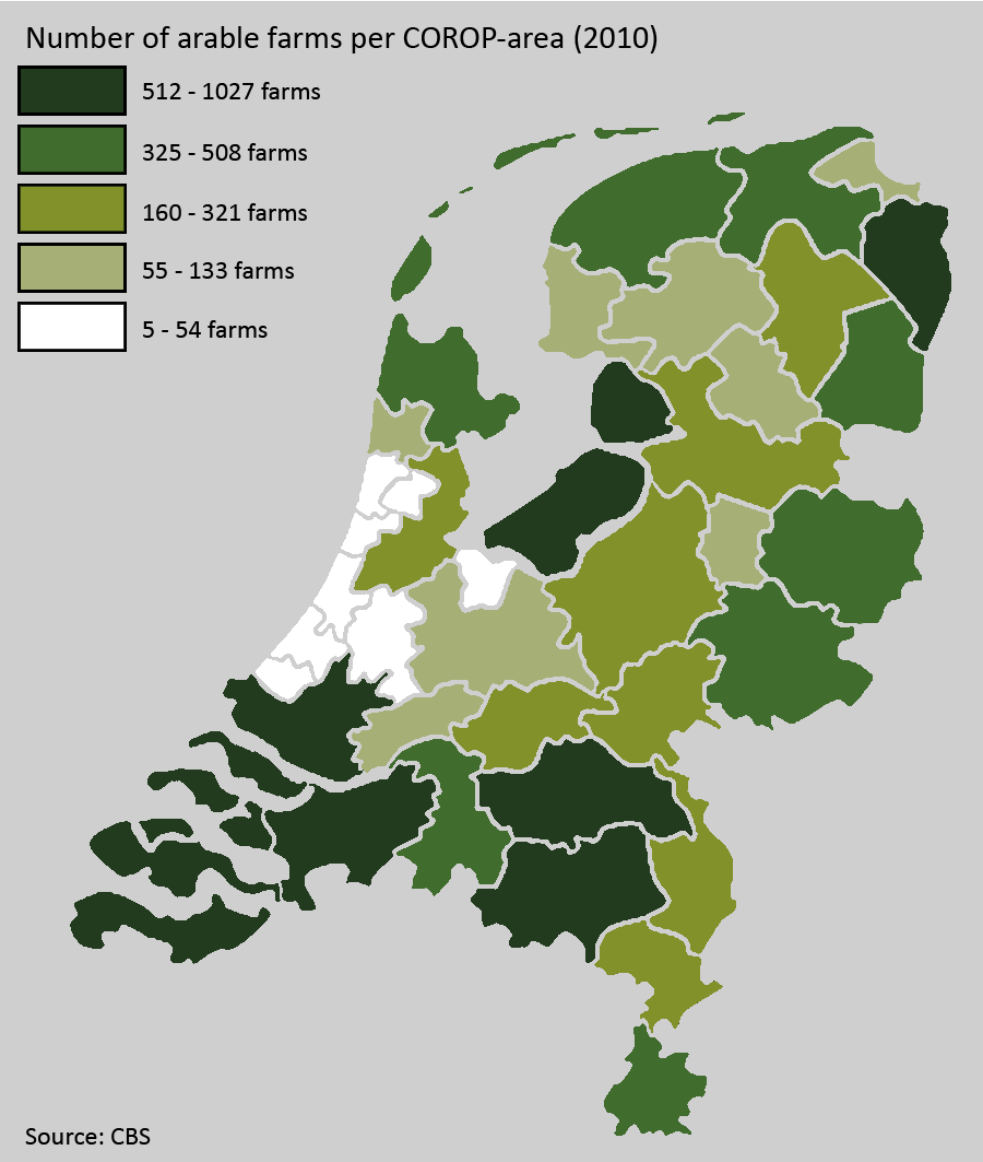

Figure 6: number of arable farms per COROP-area (2010)

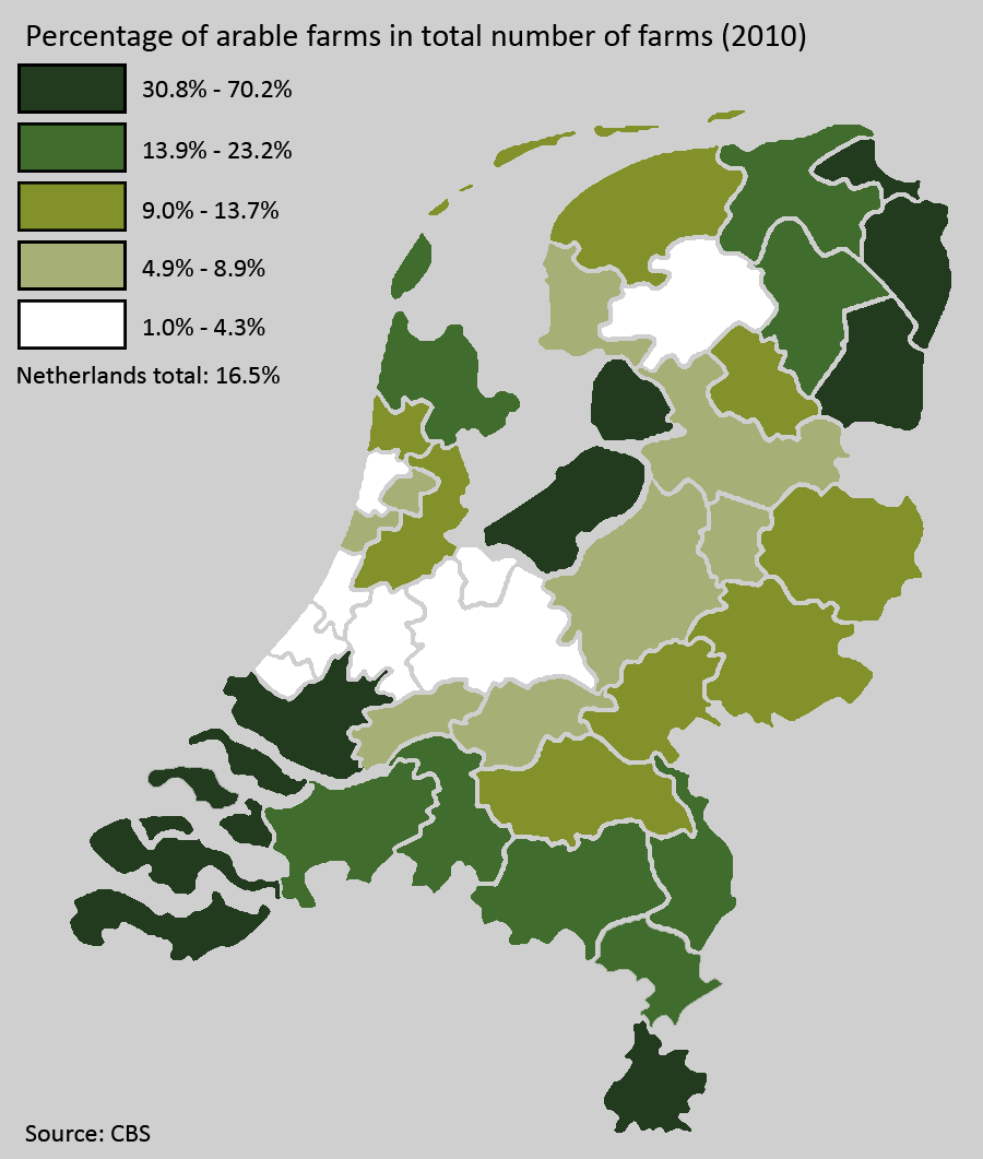

Figure 7: percentage of arable farms in total number of farms (2010)

The reason why arable farms are mainly located in the province of *Zeeland, Flevoland* and *Groningen* is because of the soil type that is needed for arable farms; sea clay and peat is suitable for the production of potatoes, cereals and beets. Also clay, located near rivers in the south of the Netherlands (provinces of *Noord Brabant* and Limburg), is suitable for arable farms.

6.2 Horticulture

Horticulture exists in two kinds:

- Horticulture in greenhouses: expensive form of production because of necessary investments (in greenhouses), high energy consumption costs and high labor costs. To minimize the costs of horticulture in greenhouses is clustered in the more urbanized western part of the Netherlands (lower transportation costs etc.).
- Horticulture in open ground: especially in *Kop van Noord-Holland (Bollenstreek)* (see chapter 1.5).

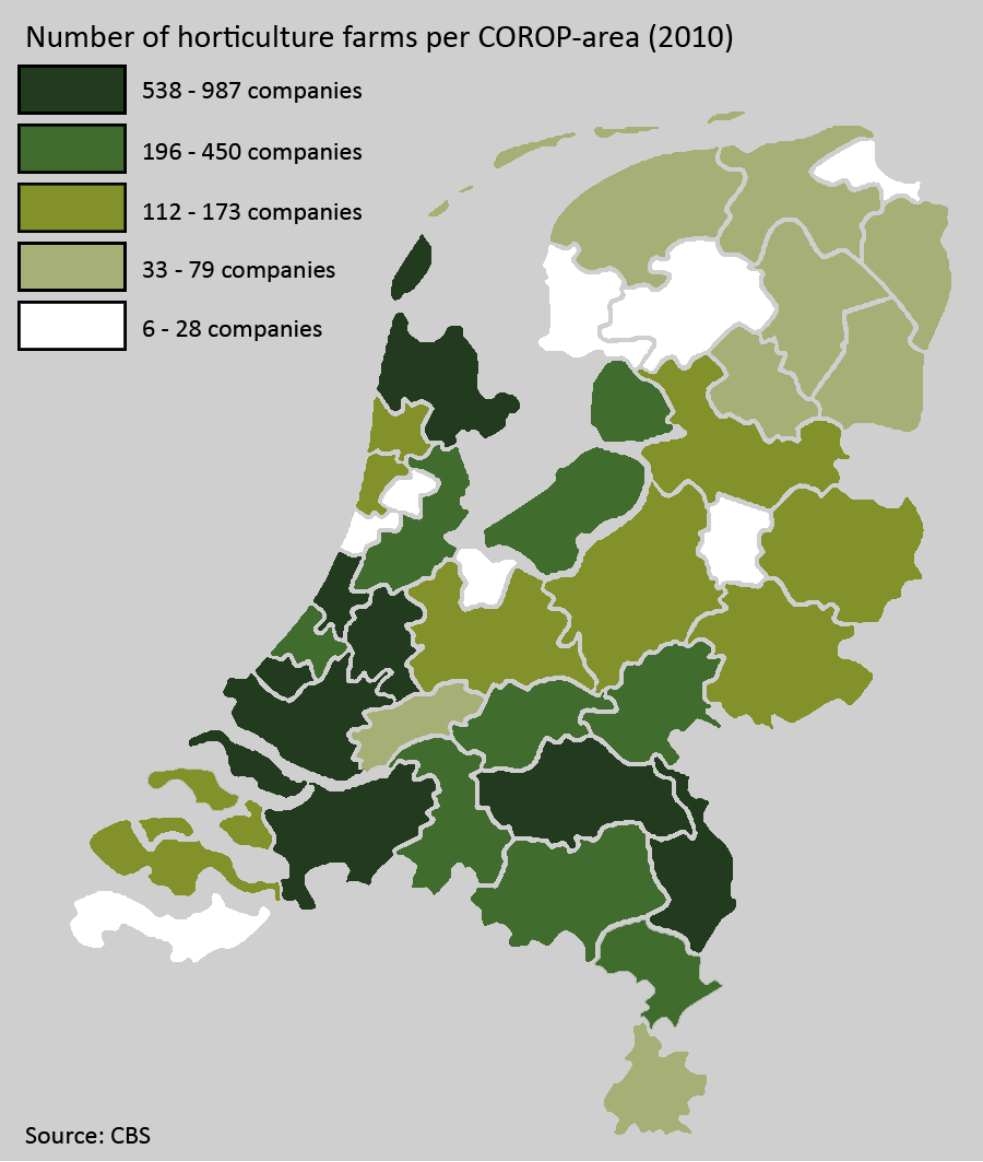

Figure 8: number of horticulture farms per COROP-area (2010)

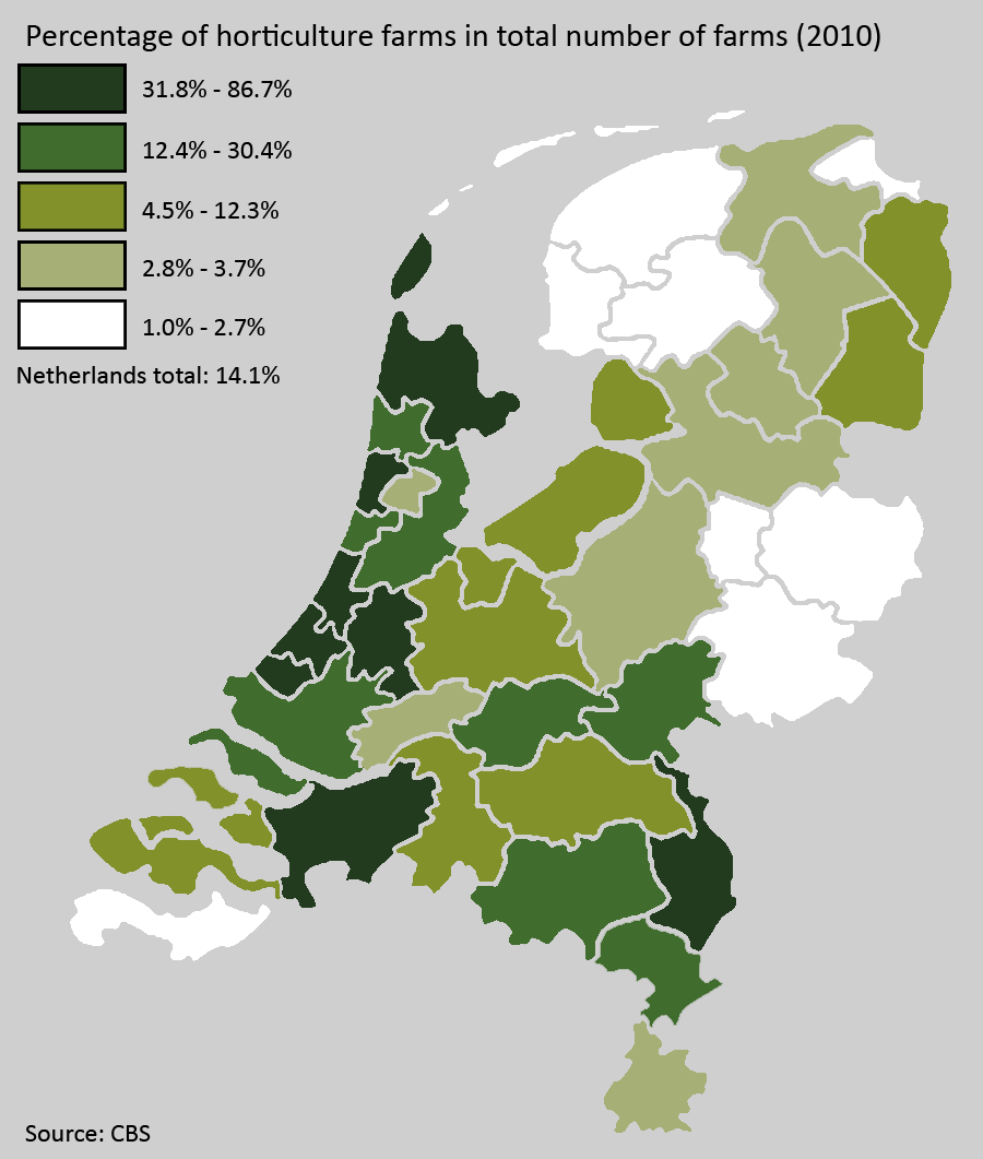

Figure 9: percentage of horticulture farms in total number of farms (2010)

It is clear that horticulture almost plays no role in the north-eastern part of the Netherlands. There are some horticulture companies, but they are outnumbered by the number of farms from the other three discussed sectors.

6.3 Sustainable livestock

Within the livestock sector, the emphasis lies on sustainable farming (grazing animals). The livestock sector produces commodities like food and fiber. This sector is mainly located in the eastern and northern part of the Netherland. Relatively large areas are needed for sustainable farming and the land in those parts of the Netherlands is the cheapest. If the soil is suitable for another form of agriculture (more profitable) than sustainable livestock farming is often not preferred.

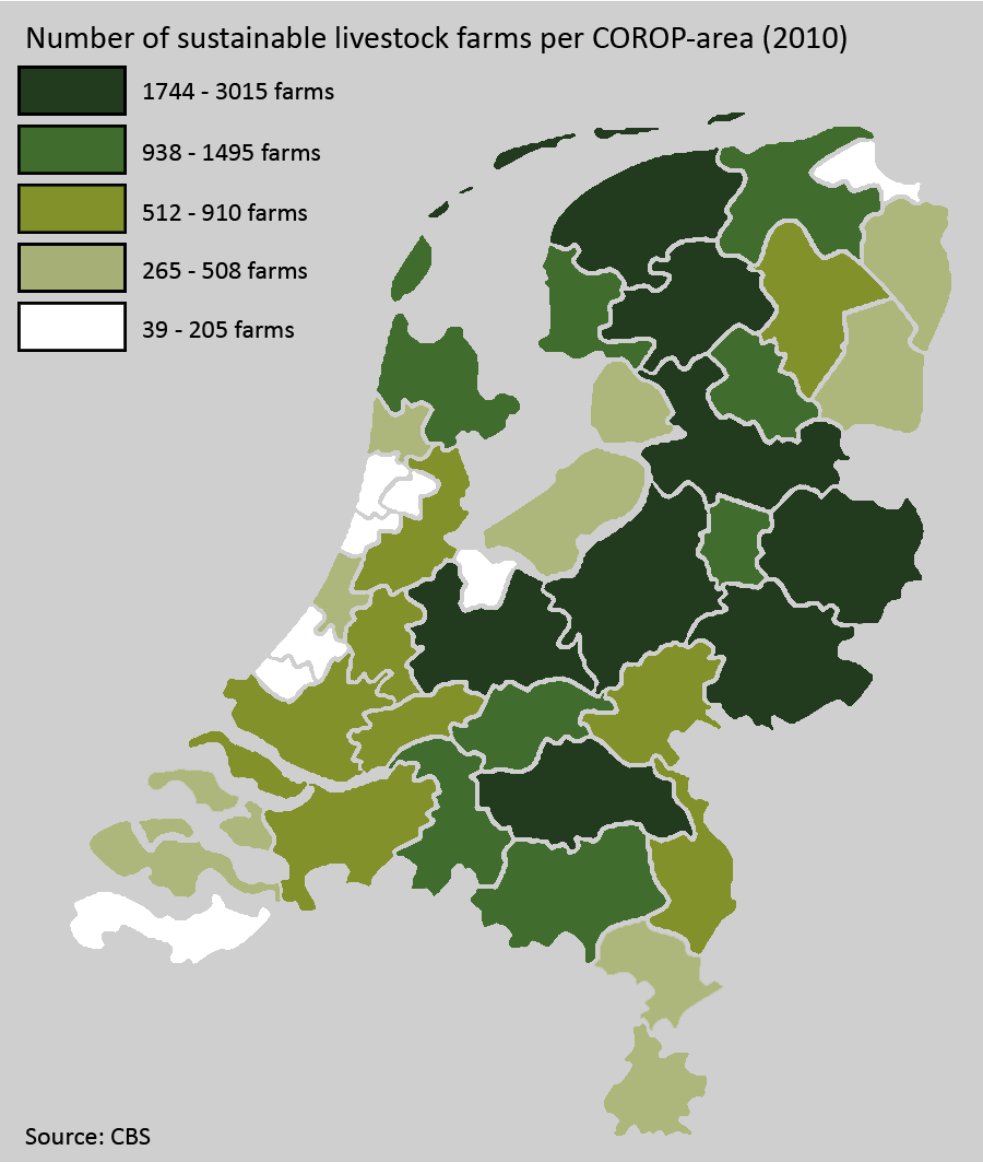

Figure 10: number of sustainable livestock farms per COROP-area (2010)

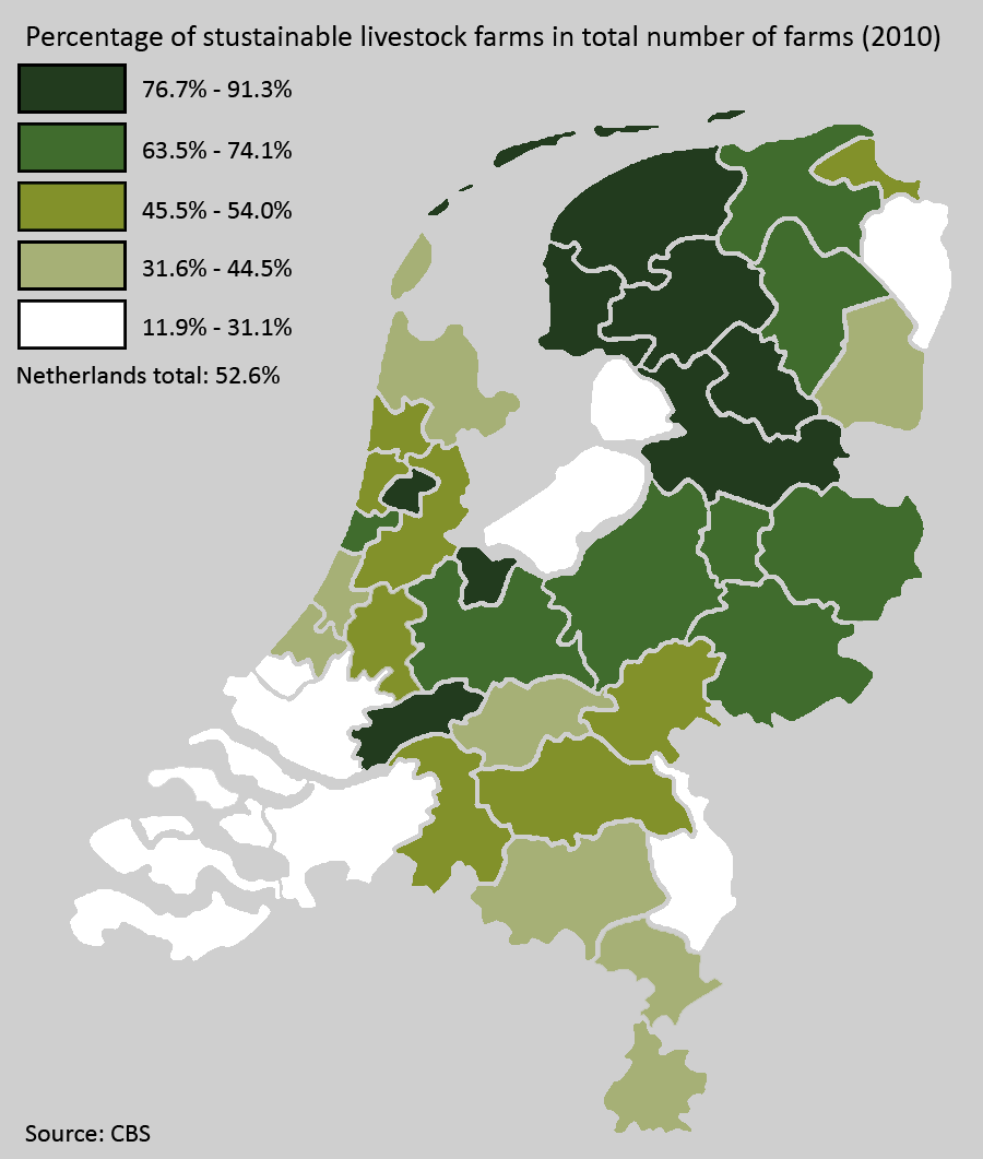

Figure 11: percentage of sustainable livestock farms in total number of farms (2010)

Sustainable farming is especially dominating in the province *Friesland. T*he Friesian pedigree cattle is known for its very high milk production. One of the world's largest dairy cooperatives, FrieslandCampina, has Friesian Roots (see chapter 1.2 and 1.3).

6.4 Intensive livestock

Another form of agriculture in the livestock sector is a more intensive form: housed animals. Housed animal farms, instead of the more sustainable form of livestock farming, are not ground-bounded because production takes place in stalls. The intensive livestock sector consists mainly of the production of pig, poultry and veal meat.

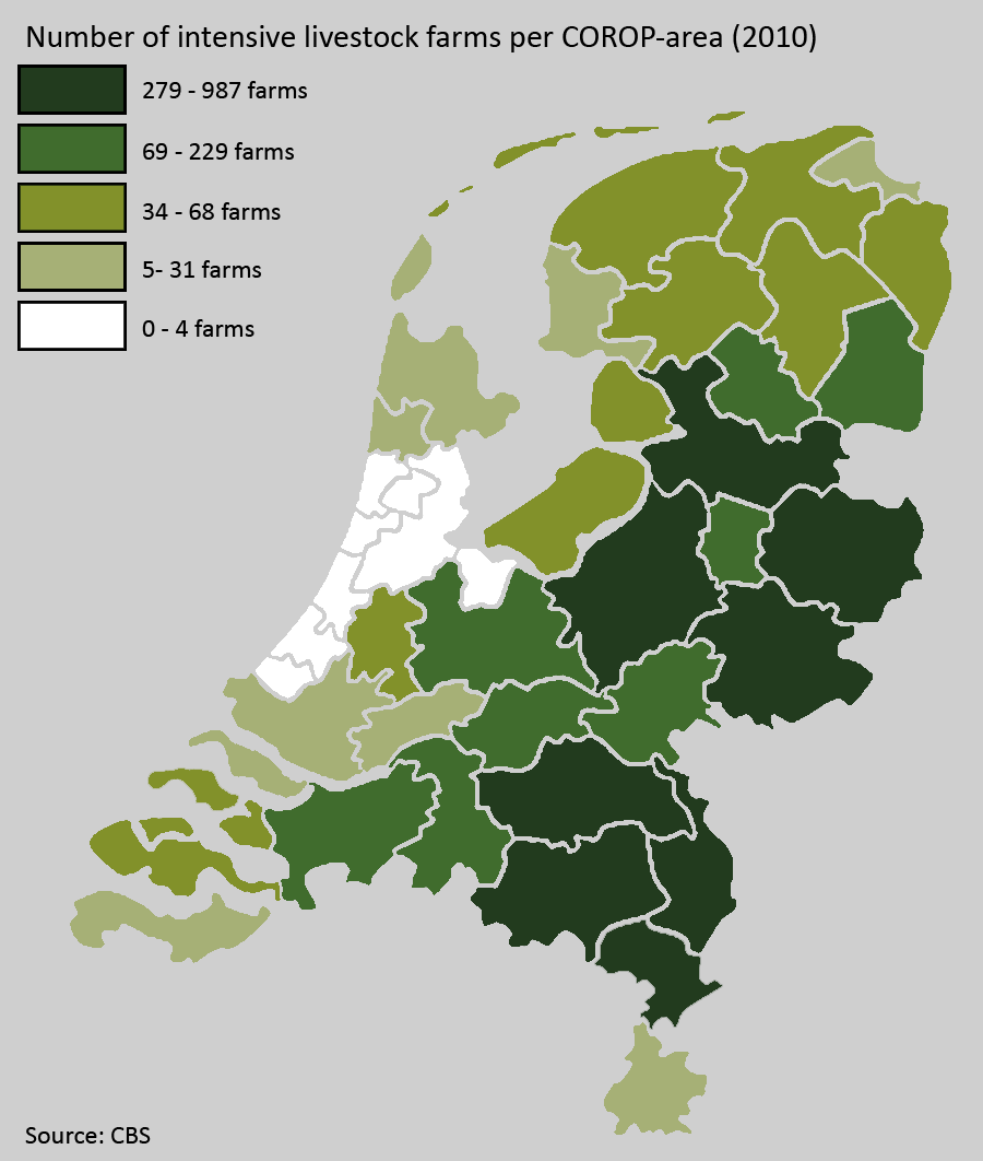

Figure 12: number of intensive livestock farms per COROP-area (2010)

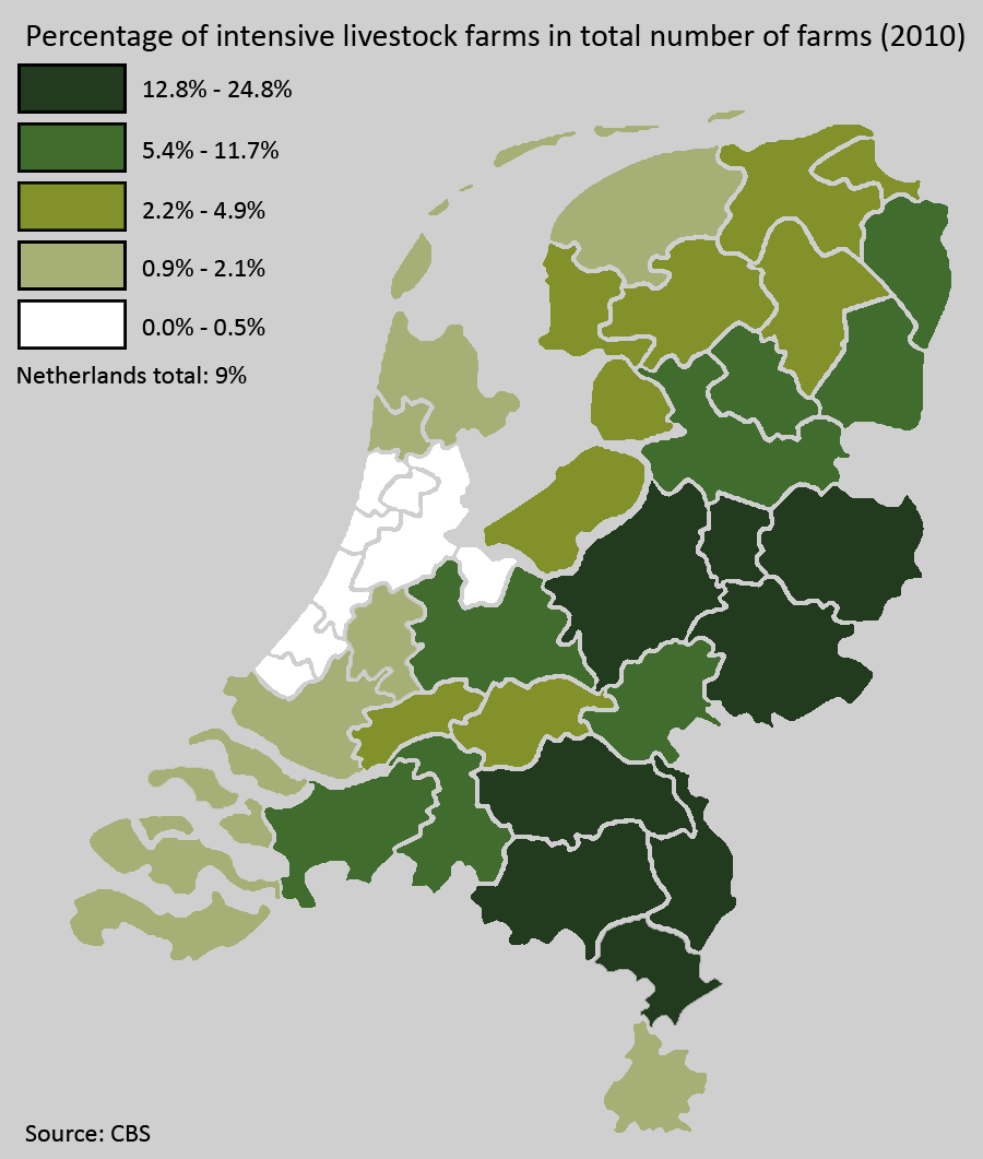

Figure 13: percentage of intensive livestock farms in total number of farms (2010)

Before 1850 almost all production in agriculture took place on sand. At first the main reason for livestock was the manure that could be used for other forms of agriculture. However when livestock became increasingly profitable farmers began to focus on livestock production. Ironically the forms of agriculture that used to be the main source of income (that previously used the manure of the livestock for production) started to make cattle feed. The area where the soil consists of sand lies in and around the area with the darkest shade of green; most of the intensive livestock is located there.

Chapter 7: Focus on floriculture clusters in the Netherlands

7.1 Floriculture

Floriculture is a discipline of horticulture concerned with the cultivation of flowering, ornamental plants. Developing new varieties of flowers and plants is major occupation of floriculturists. The cultivation of flowers and plants happens in greenhouses, outdoors and in plastic tunnels.

Flowers and ornamental plants from the Netherlands are sold all over the world. These products are either produced in the Netherlands or imported and traded through the well-known Dutch flower auctions. The Dutch floriculture industry is characterized by a good organization of the production chain. The flower industry has a long tradition in research, breeding, production and (inter)national trade. The sector aims for further strengthening the collaboration within production chain, supreme quality of products, use of modern logistics and e-commerce and adaptation to new breeding technology in order to deal with new developments such as internationalization, decentralization of flower trade and competition of tropical countries in the production of flowers (P.B. Visser, 2004).

The Netherlands is known for its tulip cultivation. In spring millions of tulips are exposed in *De Keukenhof;* a well-known flower park situated near Lisse. Yearly about 800,000 tourists from all over the world are visiting De Keukenhof.

The clustering of growers started due to ideal circumstances in a certain area; hours of sunshine a day, movement of the clouds. The clusters of growers started to attract other businesses from the flower industry to that same area, customers, suppliers etc. (Dignum, 2005).

One of the main characteristics of clusters is the concentration of knowledge. In the Dutch floriculture this is embodied in the auction system. The Dutch flower auction is owned by farmers participating in the auction (M. Dignum, 2005). The farmers are cooperating in the cooperative *FloraHolland*. The aim of the cooperative is to achieve the best possible market position for its member-growers at the lowest possible cost.

In 2004 the LEI (Wageningen University & Research center) made a report regarding the Dutch floriculture. According to the report the Dutch flower industry kept their leading position mainly due to the clustering of the trade function. However the growth of total production and trade is stagnating compared to other EU countries.

7.2 CBS Data Dutch Floriculture

The annex contains a table with data of the Dutch Floriculture from the years 2000, 2005 and 2010 provided by *CBS*.

According to the data in the table and figure 2 the total acreage of both flower bulb cultivation and tree nurseries in open ground and perennials increased in the past 10 years (CBS, 2011).

The flower cultivation area was reduced by 19% since 2000 to 4.8 thousand ha in 2010. The pot plant cultivation area has increased by nearly 10% over the past decade. The declining flower cultivation is mainly due to cut flowers, like roses and chrysanthemums, whereas more orchids were grown in greenhouses (CBS, 2011).

Greenhouse farms for flower cultivation were also scaled up from 0.9 ha in 2000 to 1.5 ha in 2010. Despite the overall increasing size of cultivation areas the amount of companies in the Dutch floriculture decreased (CBS, 2011).

Figure 15 shows the percentage of bulb cultivation by municipality in the year 2010. It shows that bulb cultivation is clustered in three municipalities: Den Helder, Stede Broec and the traditional bulb cultivation region around Lisse and Hillegom (De Bollenstreek) (CBS, 2011).

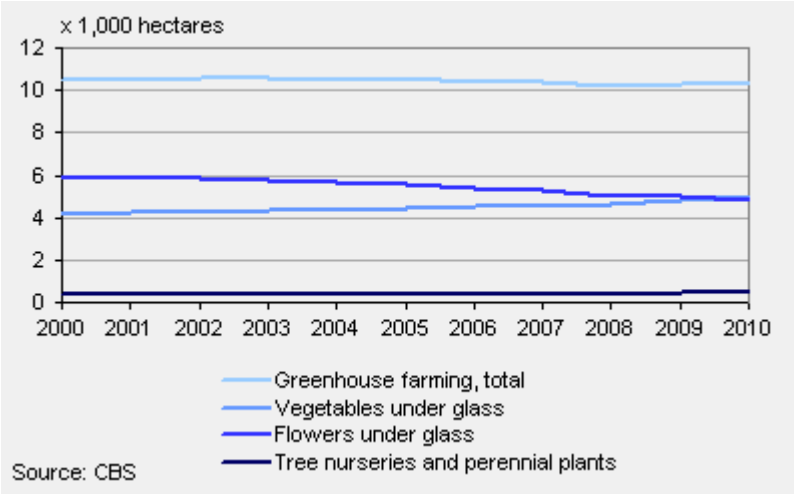

Figure 14

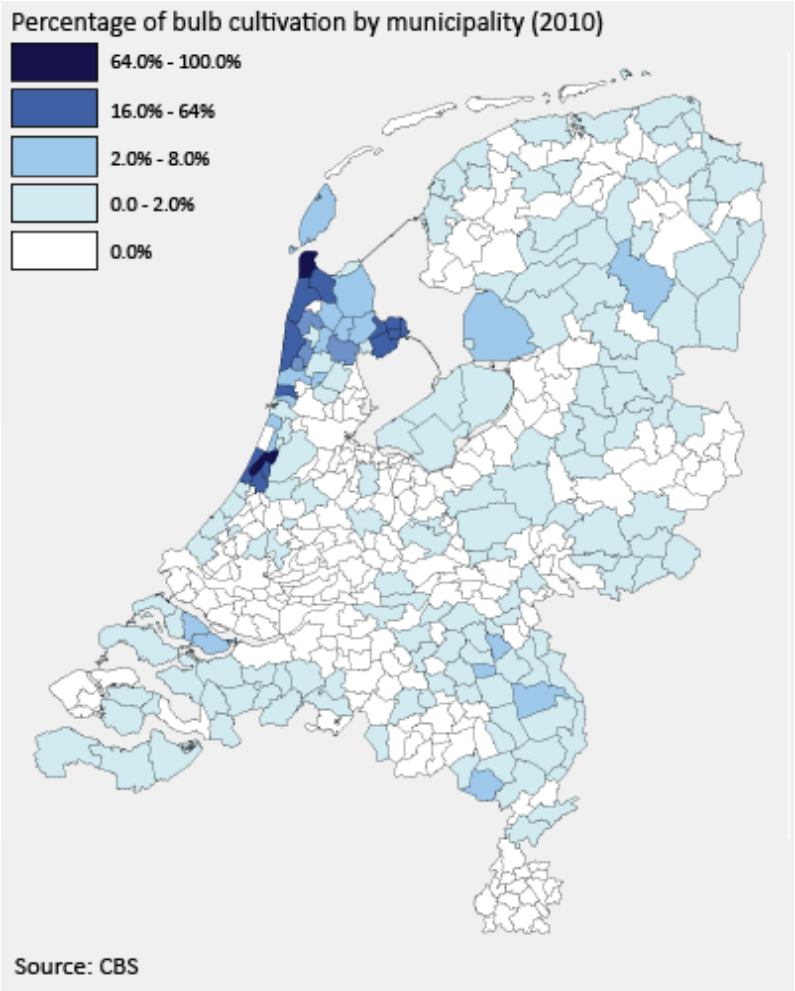

Figure 15: percentage of bulb cultivation by municipality (2010)

Open soil acreage of floriculture and bulb cultivation in the Netherlands:

Open soil floriculture and *bulb cultivation* is mainly clustered in the less urbanized west side of the Netherlands and in 'het Rivierengebied' (mainly located in parts of Limburg, Noord-Brabant and Zeeland). Especially the COROP-areas *Kop van Noord-Holland*, *Flevoland* and *Agglomeratie Leiden en Bollenstreek* are known for presence of open soil floriculture and bulb cultivation.

The main reason floriculture and bulb cultivation is clustered in the western part of the Netherlands is the type of soil that is located in that area. Soil types like sea clay (coastal area of the Netherlands) and river clay (Rivierengebied) are suitable for floriculture and bulb cultivation.

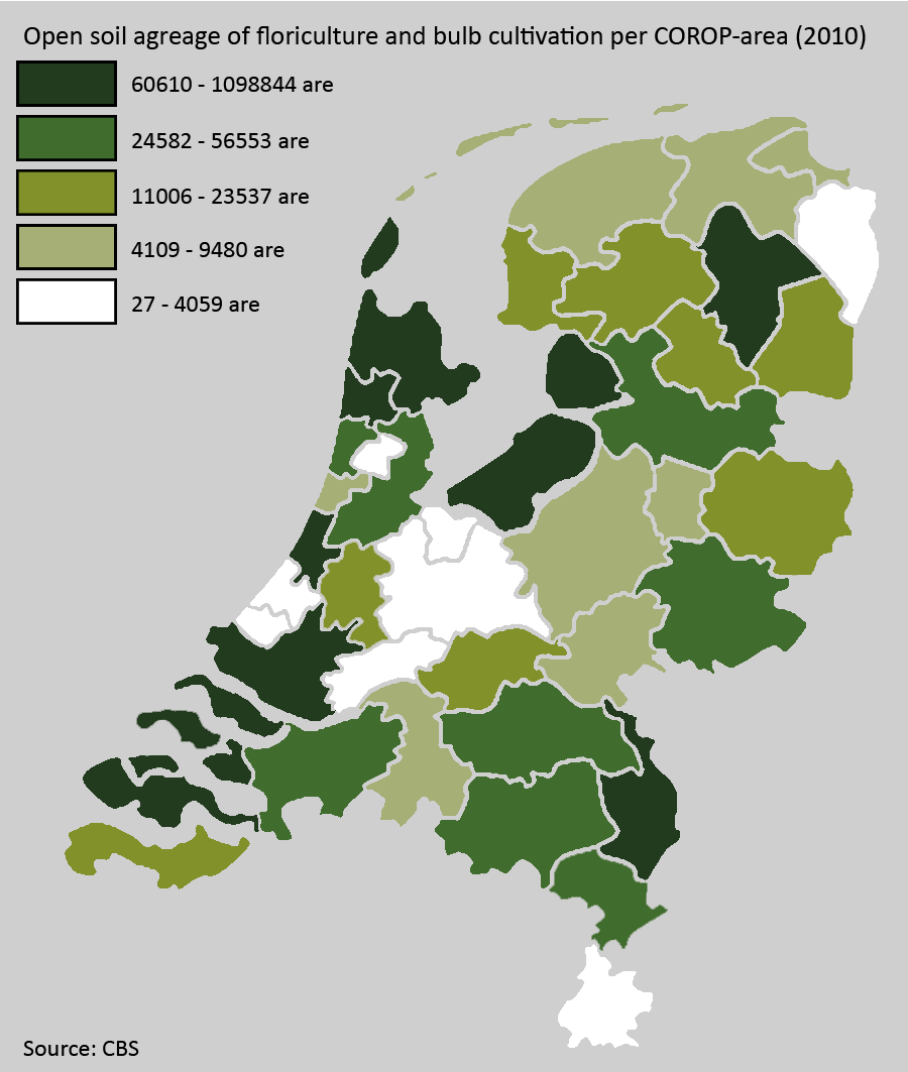

Figure 16: open soil acreage of floriculture and bulb cultivation per COROP-area (2010)

COROP-area	are
Kop van Noord-Holland	1098844
Flevoland	304213
Agglomeratie Leiden en Bollenstreek	291640
Alkmaar en omgeving	92956
Groot-Rijnmond	84810
Noord-Drenthe	77388
Noord-Limburg	72549
Overig Zeeland	60610
Midden-Limburg	56553
Noordoost-Noord-Brabant	55804
Noord-Overijssel	53923
Groot-Amsterdam	48414
West-Noord-Brabant	38718
Achterhoek	28971
IJmond	27656
Zuidoost-Noord-Brabant	24582
Zuidwest-Drenthe	23537
Zuidoost-Friesland	19587
Twente	19240
Zuidoost-Drenthe	17459
Zuidwest-Gelderland	15784
Oost-Zuid-Holland	14060
Zeeuwsch-Vlaanderen	12381
Zuidwest-Friesland	11006
Noord-Friesland	9480
Midden-Noord-Brabant	9182
Arnhem/Nijmegen	8687
Overig Groningen	8491
Zuidwest-Overijssel	5463
Delfzijl en omgeving	5456
Agglomeratie Haarlem	4704
Veluwe	4109
Oost-Groningen	4059
Zaanstreek	3977
Utrecht	3190
Delft en Westland	3109
Agglomeratie 's-Gravenhage	1548
Zuidoost-Zuid-Holland	484
Zuid-Limburg	320
Het Gooi en Vechtstreek	27

Greenhouse acreage of floriculture and bulb cultivation in the Netherlands:

Greenhouse floriculture and *bulb cultivation* is mainly clustered in the urbanized west side of the Netherlands and in 'het Rivierengebied'. Especially the COROP-area *Delft en Westland* is known for presence of greenhouse floriculture and bulb cultivation.

Greenhouses that contain floriculture are mainly clustered in the more urbanized part of the Netherlands; this is partially the case because of clustering advantages (located closely to companies like auctions, packaging companies and logistics oriented companies). World's largest flower auction Aalsmeer is located in the COROP-area *Groot Amsterdam.*

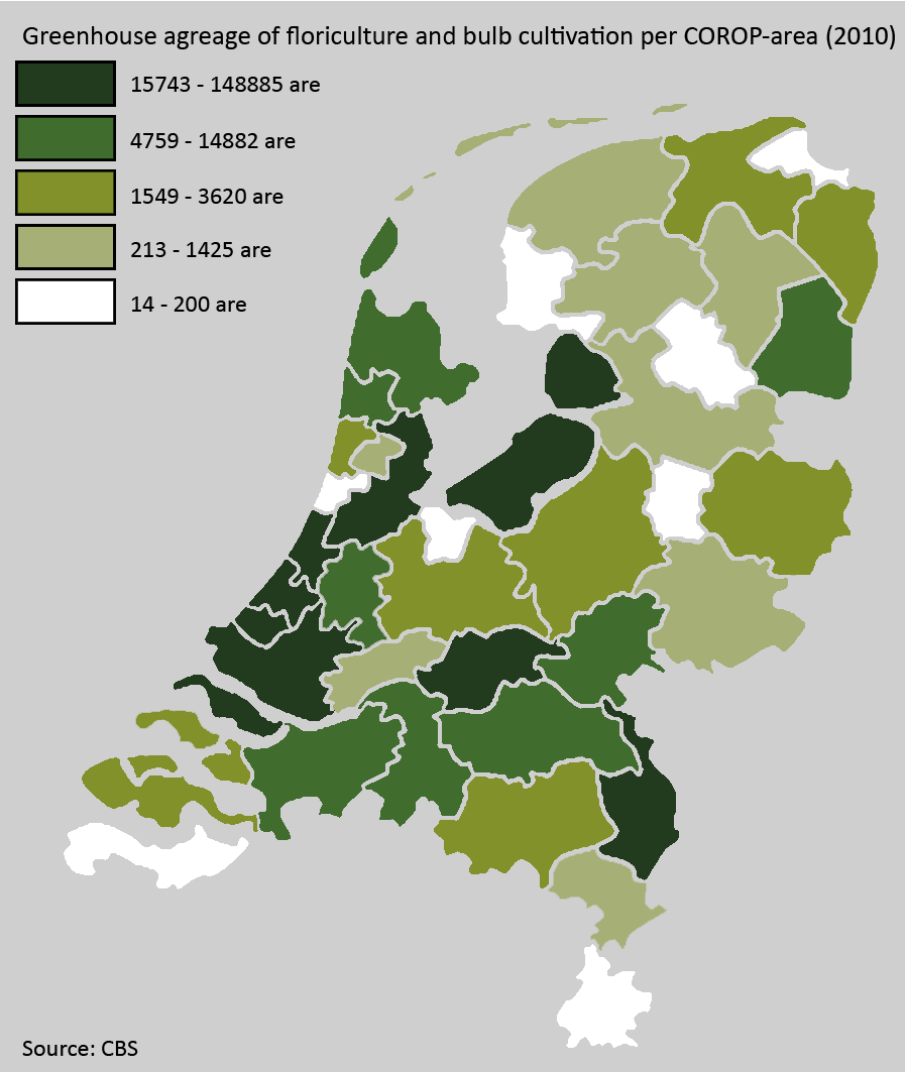

Figure 17: greenhouse acreage of floriculture and bulb cultivation per COROP-area (2010)

COROP-area	are
Delft en Westland	148885
Groot-Rijnmond	65970
Groot-Amsterdam	38253
Zuidwest-Gelderland	30271
Agglomeratie 's-Gravenhage	26248
Agglomeratie Leiden en Bollenstreek	23026
Noord-Limburg	18226
Flevoland	15743
Oost-Zuid-Holland	14882
Kop van Noord-Holland	14797
Arnhem/Nijmegen	14271
West-Noord-Brabant	10774
Alkmaar en omgeving	10504
Zuidoost-Drenthe	8969
Midden-Noord-Brabant	4913
Noordoost-Noord-Brabant	4759
Zuidoost-Noord-Brabant	3620
Twente	3048
Utrecht	2869
Overig Groningen	2436
Veluwe	2248
Overig Zeeland	1693
Oost-Groningen	1655
IJmond	1549
Zaanstreek	1425
Achterhoek	1238
Zuidoost-Zuid-Holland	1132
Midden-Limburg	1089
Noord-Friesland	818
Noord-Overijssel	633
Noord-Drenthe	449
Zuidoost-Friesland	213
Agglomeratie Haarlem	200
Zeeuwsch-Vlaanderen	181
Zuidwest-Overijssel	176
Het Gooi en Vechtstreek	140
Zuid-Limburg	75
Delfzijl en omgeving	34
Zuidwest-Friesland	15
Zuidwest-Drenthe	14

Percentage of acreage of floriculture and bulb cultivation in the Netherlands:

When you compare the acreage of floriculture and bulb cultivation to the total acreage of farmland in the Netherlands as a percentage three COROP-areas stand out: *Noord-Holland*, *Flevoland* and *Agglomeratie Leiden en Bollenstreek.* The map resembles the *Open soil acreage of floriculture and bulb cultivation in the Netherland* a lot, this because greenhouse cultivation is a lot more intense than the open soil cultivation and therefore uses less big areas of land

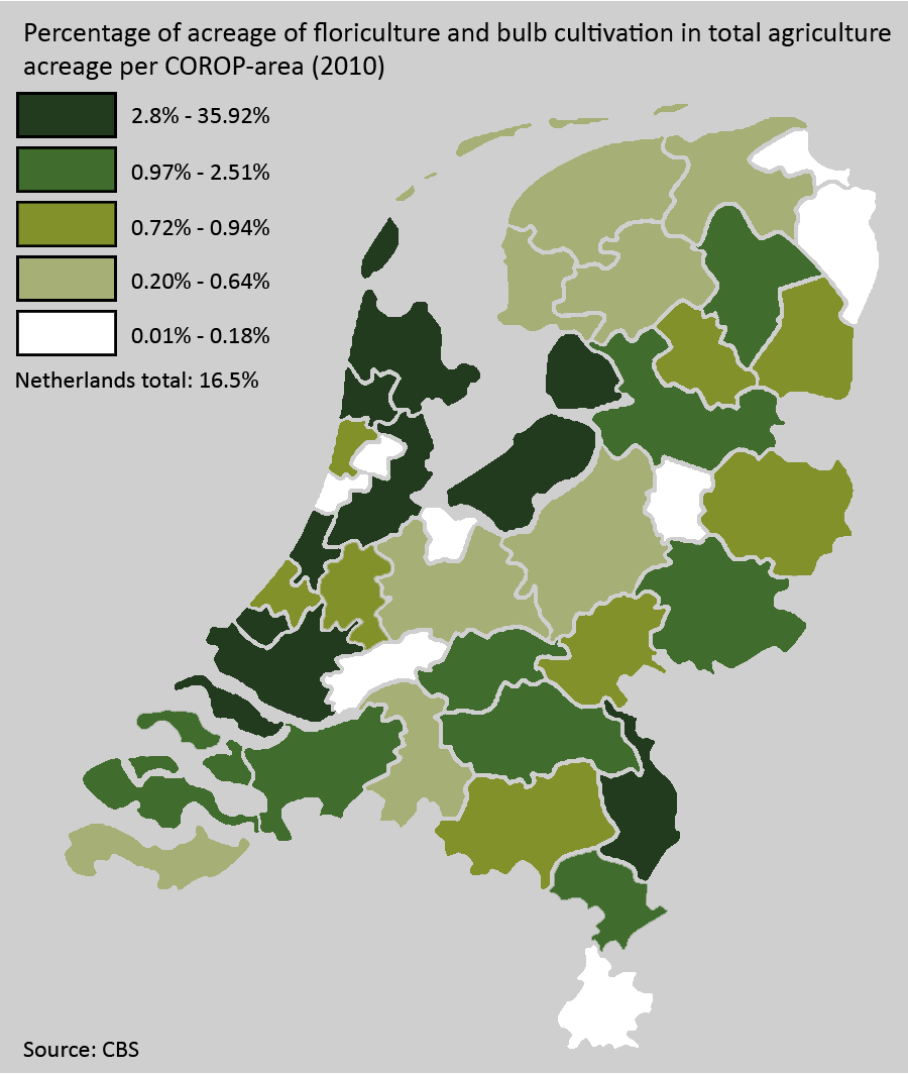

Figure 18: percentage of acreage of floriculture and bulb cultivation in total agriculture agreage per COROP-area (2010)

COROP-area	%
Kop van Noord-Holland	35,92
Flevoland	10,32
Agglomeratie Leiden en Bollenstreek	10,15
Alkmaar en omgeving	4,90
Groot-Rijnmond	4,86
Noord-Drenthe	3,34
Noord-Limburg	2,93
Overig Zeeland	2,80
Midden-Limburg	2,51
Noordoost-Noord-Brabant	2,01
Noord-Overijssel	1,95
Groot-Amsterdam	1,86
West-Noord-Brabant	1,76
Achterhoek	1,60
IJmond	1,49
Zuidoost-Noord-Brabant	0,97
Zuidwest-Drenthe	0,94
Zuidoost-Friesland	0,93
Twente	0,91
Zuidoost-Drenthe	0,90
Zuidwest-Gelderland	0,85
Oost-Zuid-Holland	0,76
Zeeuwsch-Vlaanderen	0,74
Zuidwest-Friesland	0,72
Noord-Friesland	0,64
Midden-Noord-Brabant	0,45
Arnhem/Nijmegen	0,41
Overig Groningen	0,36
Zuidwest-Overijssel	0,35
Delfzijl en omgeving	0,33
Agglomeratie Haarlem	0,21
Veluwe	0,20
Oost-Groningen	0,18
Zaanstreek	0,18
Utrecht	0,18
Delft en Westland	0,17
Agglomeratie 's-Gravenhage	0,16
Zuidoost-Zuid-Holland	0,05
Zuid-Limburg	0,01
Het Gooi en Vechtstreek	0,01

7.3 FloraHolland

In the Netherlands there used to be a lot of flower auctions but in the last few decades many acquisitions have taken place. One of the reasons for the acquisitions was the weakened international position of the Dutch floriculture. Several flower auctions merged into FloraHolland.

FloraHolland is a primary cooperative: the business is owned by its members. The cooperative partnership is a solid foundation for the development of the floriculture sector. The joining of forces to such an extent is unique in the world. FloraHolland has roughly 6,000 members, especially in the Netherlands, but also beyond (FloraHolland, 2011).

FloraHolland has 5 centers: Aalsmeer, Bleiswijk, Eelde, Naaldwijk, Rijnsburg and one joint-venture in Germany (Veiling Rhein-Maas). About 125,000 transactions are done daily. Most important import countries are: Kenya, Ethiopia, Israel, Ecuador and Germany. Most important export countries are: Germany, United Kingdom, France, Italy and Belgium FloraHolland employs over 4,000 people. The network of market locations has a combined annual turnover in flowers and plants of more than €4bn (FloraHolland, 2011).

A strong floriculture chain can only be created and maintained if parts of the chain interact and reinforce each other. In the Netherlands the creation of Greenports stimulates the interaction between parts, cooperation and accommodates a place for lobbying. FloraHolland has locations at 4 of the 5 Greenports in the Netherlands. FloraHolland sets up cooperative processes reinforcing the relationship between agrarian education and the horticulture business (FloraHolland, 2011).

The cooperative represents the interests of its members at local, regional, national and European levels. They are in constantly on-going discussion with policymakers, politicians and administrators regarding issues such as sustainability, mobility, use of space and education. The development of solutions for problems and challenges regarding logistics, businesses and entrepreneurship on a chain wide level are also a concern for FloraHolland (FloraHolland, 2011).

7.4 Auctioning

The principle of auctioning is to take care of the selling and logistics tasks for the growers. The auction is a cooperation that aims to provide the members with the best price possible. Also the logistic demands for customers are a responsibility for the auction.

The auction has always owed its strong position to the clock. The flower price starts high and decreases quickly. The buyers need to press the button on the right time in order to get the product for the right price, a competitive environment is created. This method of selling is known as the *Dutch auction*.

Every day, 39 auction clocks are in operation at FloraHolland centers. This means 125,000 auction transactions every day. In other words, 12 billion cut flowers and over half a million plants a year. About 70% of the trade is sold through the Dutch auction system, 30% of the trade is sold directly (FloraHolland, 2011).

In the floriculture a part of the trade is done by *contract farming*. Large customers such as supermarket chains have very specific demand in large quantities; agreements about the price have to be made beforehand (Dignum, 2005).

The flower auction also takes care of the quality of the products from both the supplier and buyer's standpoint, only the best quality is acceptable to sustain the flower business. If the flowers are not sold, they are being destroyed by the auction; this to prevent oversupply on the market. Destroying not sold flowers is also beneficial for the 'freshness' of the product (Dignum, 2005).

In order to take advantage of new market demand, economic developments and technological possibilities FloraHolland invests a great deal in the system of sale through the clock. For example: FloraHolland offers dealers sophisticated facilities for online buying: *Remote Buying*. With the help of such services as Remote Buying, FloraHolland is able to attract an increasing number of (international) buyers to the auction. And, the stronger the 'purchasing power', the more attractive it is for growers to trade their products through FloraHolland (FloraHolland, 2011).

To ensure the clock remains attractive, the auction process needs to be continually renewed and improved. At the Aalsmeer location, all the traditional clocks have already been replaced by large projected clocks (FloraHolland, 2011).

7.5 Determinants of National Competitive Advantage Floriculture

Chapter 2.2 gives a theoretical base for the Determinants of National Competitive Advantage. In this chapter I will deal with this theory focused on the Dutch floriculture.

Factor conditions:

Technology, labor and infrastructure (and other conditions) needed in order to be able to compete in a certain industry. For the floriculture this means:

- Ideal climate: hours of sun for instance, soil circumstances, movement of clouds.
- Infrastructure: logistics (logistic companies available), distance to Mainports (Schiphol, Rotterdam), accessibility. Also the type, quality and costs of infrastructure available are of great influence. Communication systems (mainly internet) are part of the infrastructure. As mentioned earlier; Remote Buying makes it possible for buyers to avoid congestions.
- Human resources: quantity, skills and costs of personnel. In floriculture you can think of ennoblers, application programmers etc.
- Physical resources: abundance, quality and accessibility water, minerals and power sources. Although the Netherlands have a disadvantage in physical resources compared to some other countries the development of greenhouses and growing techniques the Dutch floriculture could be competitive.
- Knowledge structure: nation's stock of scientific, technical and market knowledge influencing goods and services. The Dutch flower industry relies on input from Wageningen University and Research Centre.
- Capital resources: amount of capital available to finance the Dutch floriculture. For growers it is beneficial to be a member of FloraHolland because the auction takes care of financial tasks (Dignum, 2005).

Demand Conditions: the size and character of the home-market influence the growth, innovation and quality of the produced goods. For the floriculture this means:

- Number of independent buyers. Serving more buyers with needs for various types of products from the Dutch flower industry stimulates innovation, amount of investments in the industry and stimulates entry into the industry.
- Home demand: home demand for flowers is an important criterion to guarantee investments from the home country (Porter, 1990).
- Presence of competition: competitiveness stimulates innovation and quality of products supplied (Dignum, 2005).

Related and Supporting Industries: the presence of related and supporting industries, clusters of industries provide more effective and innovative inputs. Availability of certain types of floriculture related industries such as:

- Greenhouse construction companies.
- Logistics and transportation system companies.
- Cooling facilities companies.
- Ennoblers; for the development of new flower varieties.

Because the Netherlands does not have the ideal climate for flower cultivation having these types of companies close is crucial to prevent foreign growers producing more efficiently. Having these production accommodating businesses close gives Dutch growers the chance to invest earlier, this contributes to competitive advantage (Dignum, 2005).

Firm Strategy, Structure and Rivalry: the conditions of a nation or region influence the way that companies are organized and managed. For the floriculture this means:

- Dutch flower auctions are owned by growers, this contributes to communication within the cooperative as well as with the buyers. Despite growers working together there still has to be domestic rivalry (necessary for innovations).
- To keep the leading position on international level flowers from abroad were allowed on the Dutch auction; as a result international rivalry increased (Dignum, 2005).

Chapter 8: Conclusion

I have divided the research question, ''*How can clusters in agriculture be measured and identified in the Netherlands?'',* into two parts:

- How can clusters in agriculture be measured?
- How can clusters in agriculture be identified?

8.1 How can clusters in agriculture be measured?

There are several methods to measure clusters in agribusiness:

- *Shift share analysis*: a method of estimating the competitiveness of a certain area. Changes in employment and associated competitiveness are calculated in order to identify the source of competitiveness for regions. This tool can identify industries that have a comparative advantage in a region. Regions where the agriculture has comparative advantages agriculture clusters are likely to exist.
- *Location quotient:* a tool to measure economic strength of a certain industry in a region. A ratio is calculated that describes the regional share of an economic activity in a particular industry in a region (in this case COROP-area) compared to the national share of economic activity in that industry. This measurement tool gives information about what industries an area has and if that industry is under- or overrepresented in that area. COROP-areas with a high location quotient are likely to contain agricultural clusters.
- *Clustering based on number of farms:* because of limited data available regarding agriculture in the Netherlands I have used another way to analyze clusters in the agriculture. The method means simply dividing the number of farms of an agricultural sector in a region by the total number of farms of an agricultural sector in a nation. Multiplying that number by 100 gives percentages that indicate what regions have clustering of a certain industry within the total agriculture sector.

8.2 How can clusters in agriculture be identified?

Clusters can be identified by type of knowledge:

- Factor endowment clusters: clusters that exist because of comparative advantages.
- Techno clusters: clusters that are based on sharing of knowledge.
- Historic knowhow-based clusters: clusters that exist because of traditional knowhow advantages.

Clusters can be identified by type of development:

- Geographical clusters: clustering because of the location of a certain type or resources that are key for processing (comparable to factor endowment clusters).
- Sectorial clusters: clustering of firms from the same sector.
- Horizontal clusters: clustering of firms on a horizontal level.
  Vertical clusters: clustering of firms from the same supply chain.

8.3 Location quotients agriculture in the Netherlands

According the location quotient based on number of jobs in agriculture, forestry and fisheries the COROP-area that by far has the biggest share of employees in the agricultural sector is 'Delft en Westland' (location quotient of 6.16). The top 10 of highest location quotients based on number of jobs in the agricultural sector mainly consists of COROP-areas from the less urbanized and more remote areas of the Netherlands. The exceptions are COROP-areas in which intensive horticulture clusters are located (Delft en Westland, Agglomeratie Leiden en Bollenstreek en Oost-Zuid-Holland).

The location quotients based on number of farms per COROP-area are comparable to the location quotients based on number of jobs in agriculture. Again in the less urbanized and more remote parts of the Netherlands agriculture is overrepresented, or in other words: specialized in agricultural economic activities. Again the only COROP-areas in the most urbanized western part of the Netherlands which location quotient is relatively higher are specialized in intensive horticulture (Delft en Westland and Zuid-Oost Holland).

8.4 Cluster analysis based on number of farms in the Netherlands

- Arable farms: mainly located in the provinces Zeeland, Flevoland and Groningen; arable farms need certain soil types that are located in those provinces. Arable farms are also located near the largest rivers (Rijn/Rhine and the Maas/Meuse) in the Netherlands where the soil type is suitable for arable farms.
- Horticulture farms: horticulture in greenhouses is clustered in the urbanized western parts of the Netherlands. A less intensive form of horticulture: horticulture in open ground is mainly located in COROP-areas: *de Kop van Noord-Holland* and *Agglomeration Leiden en Bollenstreek*. Open ground horticulture is located there because of the soil type and because of certain cultivation traditions.
- Sustainable livestock: agriculture of grazing animals is mainly located in areas where the price of land is the lowest: the eastern and northern part of the Netherlands. When the soil is suitable for other kinds of agriculture (that are more profitable) sustainable farming is often not preferred.
- Intensive livestock: the more intensive form of livestock agriculture (pig, poultry and veal meat production) is mainly located in the eastern part of the Netherlands.

Discussion

- Forgot to calculate from m² to are (square decameter) of the maps in chapter 5.2; without this necessary calculation the maps were completely out of proportions.
- At first the title of the maps in chapter 3.2 contained agribusiness instead of agricomplex. Agricomplex consists of primary business as well as agribusinesses.
- The legend of the location quotient maps in chapter 3.1 and 3.2 showed that the average location quotient for the Netherlands was 1.25; however this is impossible, the average has to be 1.
- There was a moment of confusion when it seemed the calculations of the location quotient were incorrect; however it turned out that I used an equivalent of the most common location quotient formula.
- Another misunderstanding concerning the location quotient was that I thought I used an incorrect formula, but according to the used excel spreadsheets the results were correct after all.
- Adobe Photoshop isn't an application that is aimed to make maps but because I've been working with the application for quite a while now I managed to get acceptable results. Making the maps by myself has taken a lot of time.
- I have changed the formulation of the research question a few times; however this had no huge effects on the content of the research.
- The chapter order is changed a few times during the writing of the thesis; the current order is the most logical in my opinion.
- The completion of this thesis took quite a while, not filling out the form in the *BSc-thesis BEB protocol* may contribute to this. Having more concrete deadlines that have been agreed upon beforehand might have sped up the completion process.
- I have written this thesis in English, my main reason why I wanted to this was because most of the literature is available in English; dealing with the correct terminology became easier this way. However because English is not my first language (limited vocabulary) I sometimes had difficulties in writing the thesis. Online translator: *Google Translate* was one of my best friends during writing this thesis.
- I have not covered all agricultural sectors (only the four largest) in chapter 5. This because of limited time and data available.
- At first I did not use Endnote to make the references, so it took a lot of time. After a while I started using it, so making the references became a lot more efficient instantly.
- This point of discussion is actually quite ironic; the chapter discussion could have been more complete and more detailed if I would have updated the discussion chapter more consistently throughout the process. I haven't done this and as a result this chapter is not as complete as it could have been, however the most important discussion issues have been treated.

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Annex

A. CBS data horticulture

			Regio's	Nederland	Nederland	Nederland
Onderwerpen_2	Onderwerpen_3	Onderwerpen_4	Perioden	2000	2005	2010
Oppervlakte	Bloembollen en -knollen	Bloembollen en -knollen, total	are	2251266	2298728	2334701
Oppervlakte	Bloemkwekerijgewassen	Bloemkwekerijgewassen, total	are	292972	284341	288270
Oppervlakte	Boomkwekerijgewassen en vaste planten	Boomkwekerij en vaste planten, totaal	are	1264110	1457553	1691156
Aantal bedrijven	Bloembollen en -knollen	Bloembollen en -knollen, total	aantal	2709	2176	1687
Aantal bedrijven	Bloemkwekerijgewassen	Bloemkwekerijgewassen, total	aantal	2497	1882	1421
Aantal bedrijven	Boomkwekerijgewassen en vaste planten	Boomkwekerij en vaste planten, totaal	aantal	5037	4145	3590
Oppervlakte	Bloemkwekerijgewassen	Bloemkwekerijgewassen, total	m2	59220425	56159332	47743661
Oppervlakte	Boomkwekerijgewassen en vaste planten	Boomkwekerij en vaste planten, totaal	m2	3687178	4331312	4914984
Aantal bedrijven	Bloemkwekerijgewassen	Bloemkwekerijgewassen, total	aantal	6574	5071	3247
Aantal bedrijven	Boomkwekerijgewassen en vaste planten	Boomkwekerij en vaste planten, totaal	aantal	1442	1282	900
Oppervlakte, hoeveelheid	Bollenbroei	Hyacintenbroei	1000 stuks	.	97981	88436
Oppervlakte, hoeveelheid	Bollenbroei	Narcissenbroei	1000 kg	3421	3223	3067
Oppervlakte, hoeveelheid	Bollenbroei	Tulpenbroei	1000 stuks	1021031	1529786	1386297
Aantal bedrijven	Bollenbroei	Bollenbroei, total	aantal	1066	959	648
Aantal bedrijven	Bollenbroei	Hyacintenbroei	aantal	.	119	92
Aantal bedrijven	Bollenbroei	Narcissenbroei	aantal	254	211	140
Aantal bedrijven	Bollenbroei	Tulpenbroei	aantal	970	823	538

B. COROP-areas

C: CBS, Employment (agriculture, forestry and fisheries)

Number of jobs (2009)

Regions	Location Quotient
Delft en Westland	6,16
Noord-Limburg	4,34
Kop van Noord-Holland	3,73
Zuidwest-Gelderland	2,79
Oost-Zuid-Holland	2,39
Overig Zeeland	1,67
Zuidwest-Overijssel	1,57
Midden-Limburg	1,47
Flevoland	1,35
Agglomeratie Leiden en Bollenstreek	1,33
Noordoost-Noord-Brabant	1,31
Alkmaar en omgeving	1,30
Zuidoost-Drenthe	1,26
West-Noord-Brabant	1,17
Zuidwest-Friesland	1,13
Achterhoek	1,08
Noord-Friesland	1,07
Zeeuwsch-Vlaanderen	1,00
Noord-Drenthe	0,96
Zuidwest-Drenthe	0,96
Veluwe	0,94
Noord-Overijssel	0,93
Delfzijl en omgeving	0,85
Zuidoost-Noord-Brabant	0,84
Midden-Noord-Brabant	0,80
IJmond	0,76
Oost-Groningen	0,75
Groot-Rijnmond	0,70
Arnhem/Nijmegen	0,59
Zuidoost-Friesland	0,58
Twente	0,58
Zuidoost-Zuid-Holland	0,52
Zaanstreek	0,52
Agglomeratie 's-Gravenhage	0,51
Overig Groningen	0,49
Het Gooi en Vechtstreek	0,46
Utrecht	0,38
Groot-Amsterdam	0,36
Zuid-Limburg	0,27
Agglomeratie Haarlem	0,16

D: CBS, Companies, establishments by economic activity (SBI 2008)

Number of farms (2010)

Regions	Location Quotient
Zeeuwsch-Vlaanderen	2,53
Achterhoek	2,23
Delfzijl en omgeving	2,13
Noord-Overijssel	2,08
Zuidwest-Overijssel	2,07
Zuidoost-Friesland	1,94
Zuidwest-Drenthe	1,93
Zuidwest-Friesland	1,92
Noord-Limburg	1,90
Noord-Friesland	1,83
Noord-Drenthe	1,80
Oost-Groningen	1,78
Zuidwest-Gelderland	1,71
Zuidoost-Drenthe	1,66
Twente	1,59
Overig Zeeland	1,59
Delft en Westland	1,54
Kop van Noord-Holland	1,51
Midden-Limburg	1,40
Veluwe	1,35
Noordoost-Noord-Brabant	1,33
Overig Groningen	1,31
Oost-Zuid-Holland	1,29
Flevoland	1,19
West-Noord-Brabant	1,02
Zuidoost-Noord-Brabant	1,02
Midden-Noord-Brabant	0,94
Agglomeratie Leiden en Bollenstreek	0,63
Zuidoost-Zuid-Holland	0,62
Arnhem / Nijmegen	0,59
Utrecht	0,53
Zuid-Limburg	0,51
Alkmaar en omgeving	0,50
Agglomeratie 's-Gravenhage	0,49
Groot-Rijnmond	0,45
IJmond	0,32
Zaanstreek	0,30
Groot-Amsterdam	0,21
Het Gooi en Vechtstreek	0,17
Agglomeratie Haarlem	0,06