AGRICULTURAL CLUSTERS IN THE NETHERLANDS

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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. This article aims at determining and measuring agricultural clusters in the Netherlands.

Key words: localization, food industry, national rural strategy, sustainability, local markets, farmer

Introduction

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. Economies 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 et al., 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.

Further, it can be observed that the competitiveness of clusters increasingly depends on sustainable economic growth (Martin S. et al., 2008). This means that competitiveness not only depends on the lowest possible costs but also on the abatement of negative externalities on the basis of cleaner technologies.

The Dutch agribusiness has changed in the last few decades. There has been a continuous process of scaling up. The scaling up was mainly 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 et al., 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. Transportations on larger distance became possible; as a result, the frequency of milk collections could decrease, so the clustering of companies became easier (Silvis et al., 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 internationally oriented (Silvis et al., 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 et al., 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.

Clusters and competitiveness

Porter (1990) 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. The same principle applies for regions instead of nations.

The determinants of National Competitive Advantage are the following:

❒ Factor Conditions: technology, labour 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.

Figure 1   Determinants of National Competitive Advantage

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

Firms in clusters have clear information about the buyer's needs because of knowledge and 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.

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

❒ Clusters provide incentives for entry to 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.

Cluster measurements

There is no standard method of identifying, defining or describing a cluster. The whole 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.

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 paper we mainly use COROP-areas to compare economic activity per sector. COROP-area is a regional level between provinces and municipalities. The Netherlands is divided into 40 COROP-areas that consist of several adjacent municipalities (CBS, 2011).

A common tool to measure the economic strength of a certain industry in a region is the location quotient technique.It is 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 nation.
❒ E^j = total employment in region J.
❒ E = total employment in nation.

The location quotient ratio will be (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 extent can the region's imports of goods and services be reduced by production within its area.
❒ In what extent 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 with the help of this tool (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).

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 the regional share in number of farms:

$$\frac{Cj}{C} \times 100$$

where:

Cj – number of farms of a sector in region J
C – number of farms of a sector in nation

In Section 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.

Measuring clusters on the basis of agricultural Location quotients

This section contains maps giving location quotients based on employment (agriculture, forestry and fisheries) and number of companies (total economic activity in agriculture). All calculations for creating data used in the maps were made in Excel. The data used in calculations is provided by Statistics Netherlands (CBS). For the regional division of the Netherlands the COROP-division (NUTS-3 level) is used (Annex 1).

Annex 1   COROP-regions (NUTS-3 classification) of the Netherlands

Figure 2 presents the location quotients of agriculture. The COROP-area with by far the biggest share of total employment working in agriculture, forestry or fisheries is 'Delft en Westland'. The area is known for its intensive horticulture.

Location quotient (*LQ*) jobs Delft en Westland:

$$LQ = \frac{E_i^j / E_i}{E^j / E} = \frac{10.2/111.9}{115.3/7788.6} = 6.16$$

where:

E_i^j – number of jobs in agriculture, forestry or fisheries in COROP-area ($\times$ 1000)
E_i – number of jobs in agriculture, forestry or fisheries in the Netherlands ($\times$ 1000)
E^j – total number of jobs in a COROP-area ($\times$ 1000)
E – total number of jobs in the Netherlands ($\times$ 1000)

Figure 2   Location quotients based on number of jobs in agriculture, forestry and fisheries
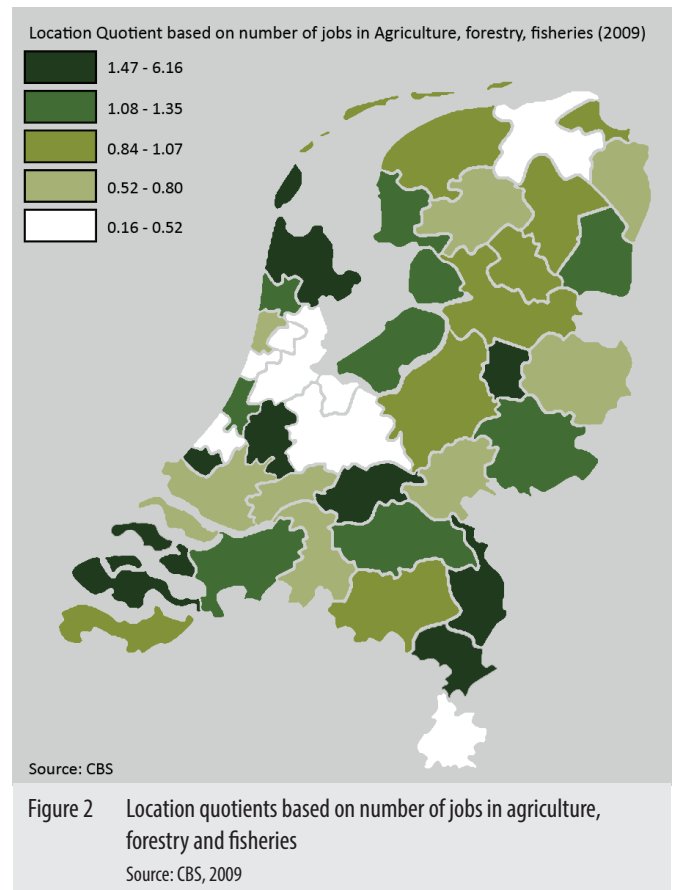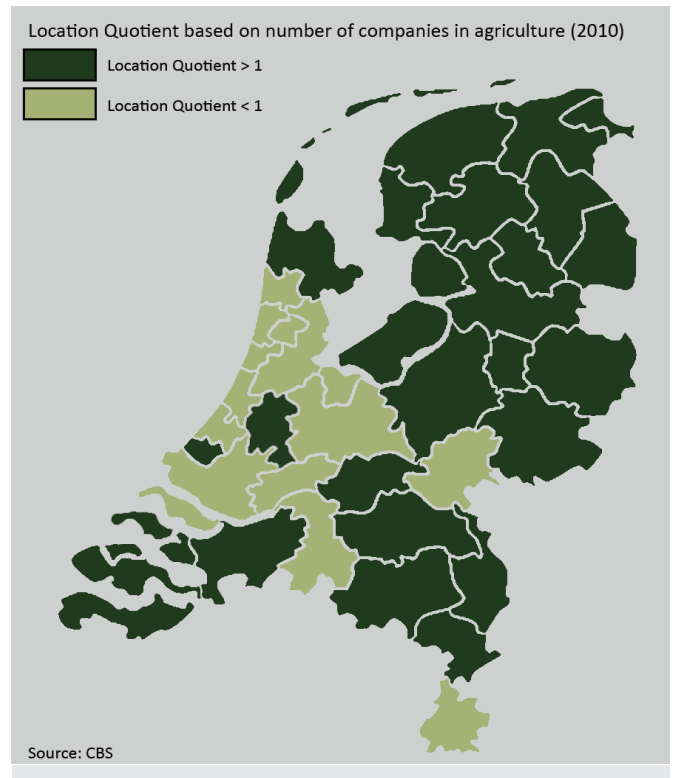Source: CBS, 2009

Figure 3 divides the regions into regions with an LQ for agriculture that is lower than 1 and regions with an LQ for agriculture that exceeds 1. The darker shade of green shows the COROP-areas with a location quotient exceeding 1. It is quite clear that 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 relatively large share of total employment falls on agriculture. This is mainly due to the large amount of horticultural farms clustered in these regions.

Figure 4 presents the LQ based on number of farms per COROP-area. This figure is - not surprisingly - comparable with the LQ based on employment. The less urbanized regions, mainly located in the eastern and northern part of the Netherlands, have higher location quotients. 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).
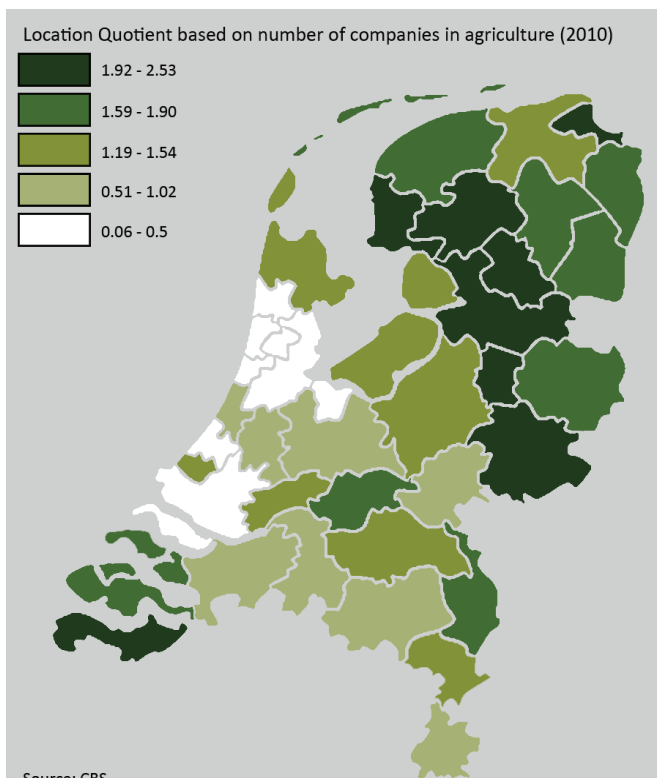
Figure 3   Location quotients based on number of jobs in agriculture, forestry and fisheries
Source: CBS, 2009

Figure 4   Location quotients based on number farms in agriculture
Source: CBS, 2009

Figure 5   Location quotients (light: <1; dark: >1) based on number farms in agriculture
Source: CBS, 2010

$$LQ \text{ (Zeeuwsh} - \text{Vlaanderen)} = \frac{C_i^j / C_i}{C^j / C} = \frac{1390/83355}{6310/956210} = 2.53$$

where:

C_i^j – number of companies in agriculture in a COROP-area ($\times$ 1000)
C_i – number of companies in agriculture in the Netherlands ($\times$ 1000)
C^j – total number of companies in a COROP-area ($\times$ 1000)
C – total number of companies in the Netherlands ($\times$ 1000).

Figure 5 supports the rule that in general the less urbanized and more remote COROP-areas are more specialized in agriculture.

Just as with the LQ based upon employment 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.

Measuring clusters on the basis of numbers of farms

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 beet.
❑ Horticultural farms: 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.

Figure 6 presents the number of arable farms per region and Figure 7 the number of arable farms as a percentage of the total number of arable farms in the Netherlands.

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
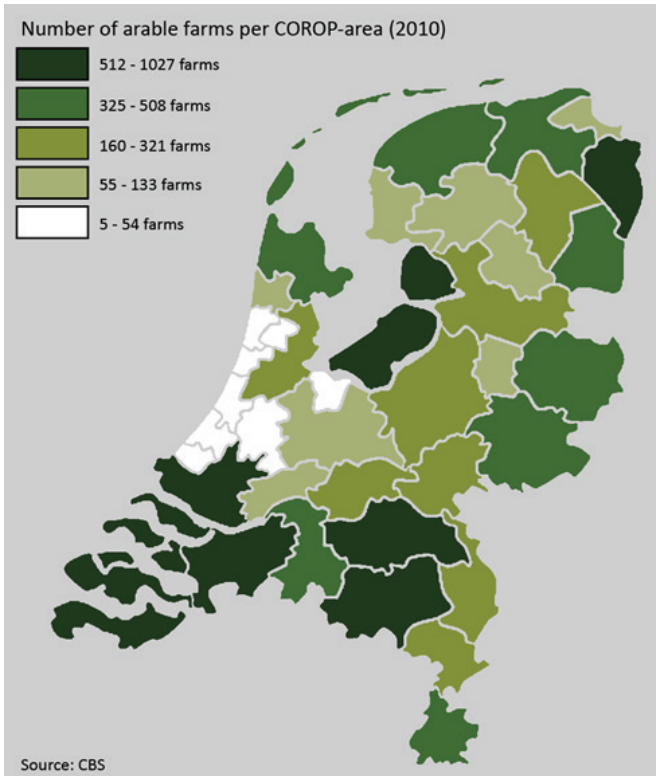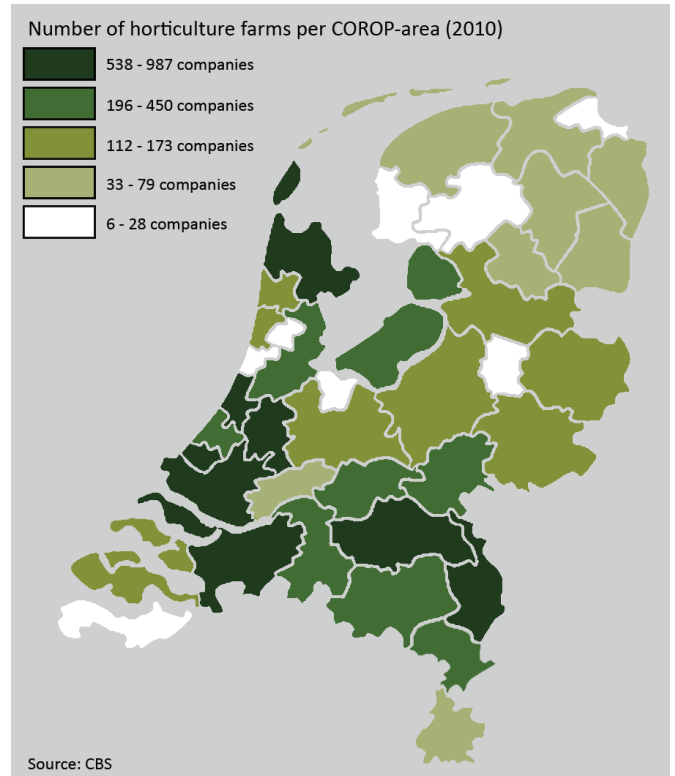
Number of arable farms per COROP-area (2010)

- 512 – 1027 farms
- 325 – 508 farms
- 160 – 321 farms
- 55 – 133 farms
- 5 – 54 farms

Source: CBS

Figure 6   Number of arable farms per COROP-area
Source: CBS, 2010

Number of horticulture farms per COROP-area (2010)

- 538 – 987 companies
- 196 – 450 companies
- 112 – 173 companies
- 33 – 79 companies
- 6 – 28 companies

Source: CBS

Figure 8   Number of horticultural farms per COROP-area
Source: CBS, 2010

Percentage of arable farms in total number of farms (2010)

- 30.8% – 70.2%
- 13.9% – 23.2%
- 9.0% – 13.7%
- 4.9% – 8.9%
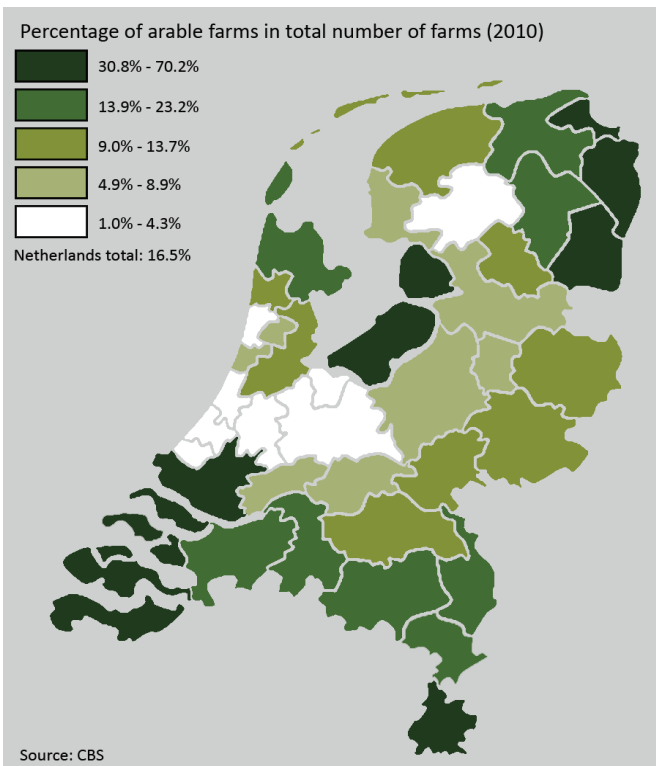- 1.0% – 4.3%

Netherlands total: 16.5%

Source: CBS

Figure 7   Arable farms as a percentage of the total number of arable farms in the Netherlands
Source: CBS, 2010

Percentage of horticulture farms in total number of farms (2010)

- 31.8% – 86.7%
- 12.4% – 30.4%
- 4.5% – 12.3%
- 2.8% – 3.7%
- 1.0% – 2.7%
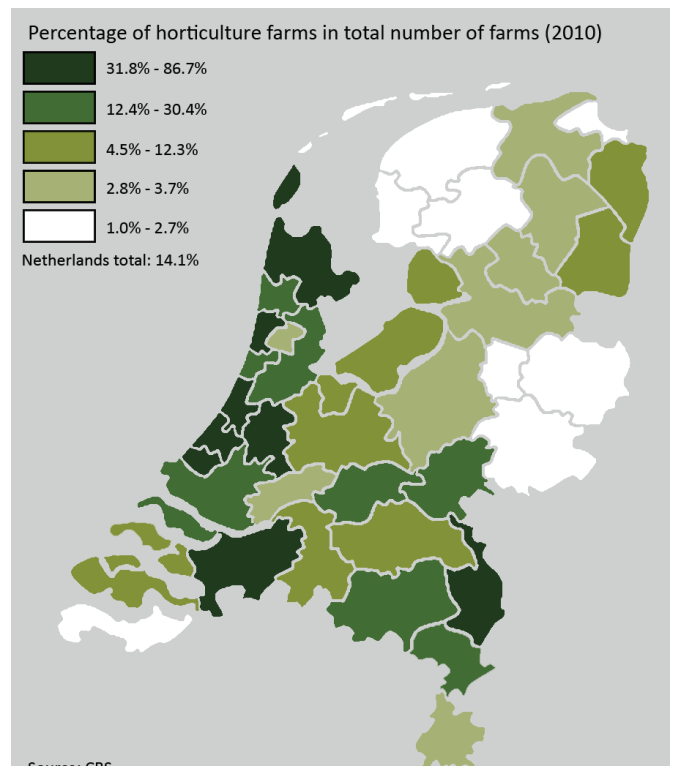
Netherlands total: 14.1%

Source: CBS

Figure 9: Horticultural farms as a percentage of the total number of horticultural farms in the Netherlands
Source: CBS, 2010

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. Horticulture exists in two kinds:

☐ Horticulture in greenhouses: expensive form of production because of necessary investments (in greenhouses), high energy consumption costs and high labour costs. To minimize the costs of horticulture in greenhouses, it 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.

Figure 8 presents the number of horticultural farms per region and Figure 9 the number of horticultural farms as a percentage of the total number of horticultural farms in the Netherlands.

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

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 presents the number of sustainable livestock farms per region; Figure 11 the number of sustainable livestock farms as a percentage of the total number of sustainable livestock farms in the Netherlands.

Sustainable farming is especially dominating in the Province ofFriesland. The Friesian pedigree cattle is known for its high milk production. Royal Friesland Campina, one of the world's largest dairy cooperatives, has Friesian Roots.

Intensive livestock farms are engaged in housed animals. Housed animal farms, instead of the more sustainable form of livestock farming, are
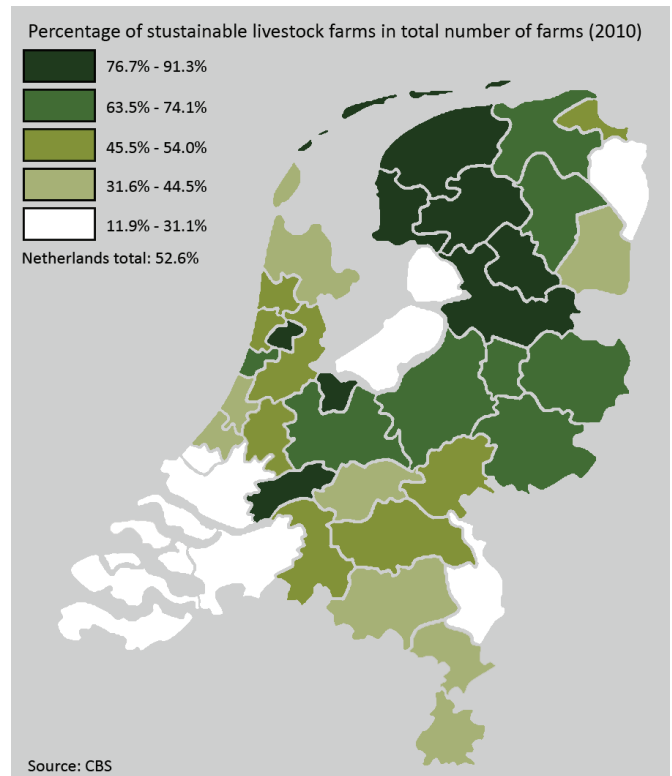

Percentage of stustainable livestock farms in total number of farms (2010)

- 76.7% - 91.3%
- 63.5% - 74.1%
- 45.5% - 54.0%
- 31.6% - 44.5%
- 11.9% - 31.1%

Netherlands total: 52.6%

Source: CBS

Figure 11   Sustainable livestock farms as a percentage of the total number of sustainable livestock farms in the Netherlands
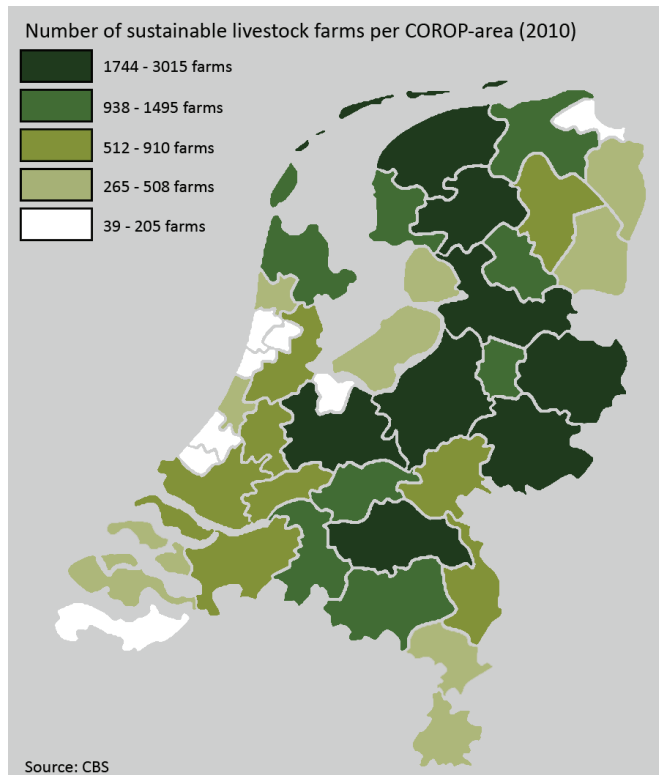Source: CBS, 2010

Number of sustainable livestock farms per COROP-area (2010)

- 1744 - 3015 farms
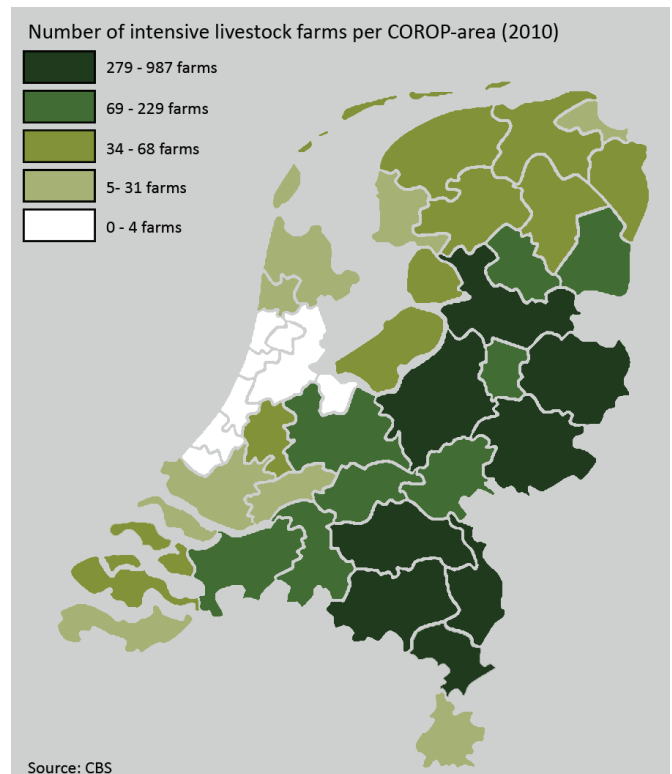- 938 - 1495 farms
- 512 - 910 farms
- 265 - 508 farms
- 39 - 205 farms

Source: CBS

Figure 10   Number of sustainable livestock farms per COROP-area
Source: CBS, 2010

Number of intensive livestock farms per COROP-area (2010)

- 279 - 987 farms
- 69 - 229 farms
- 34 - 68 farms
- 5 - 31 farms
- 0 - 4 farms

Source: CBS

Figure 12   Number of intensive livestock farms per COROP-area
Source: CBS, 2010

Percentage of intensive livestock farms in total number of farms (2010)

- 12.8% - 24.8%
- 5.4% - 11.7%
- 2.2% - 4.9%
- 0.9% - 2.1%
- 0.0% - 0.5%

Netherlands total: 9%

Source: CBS

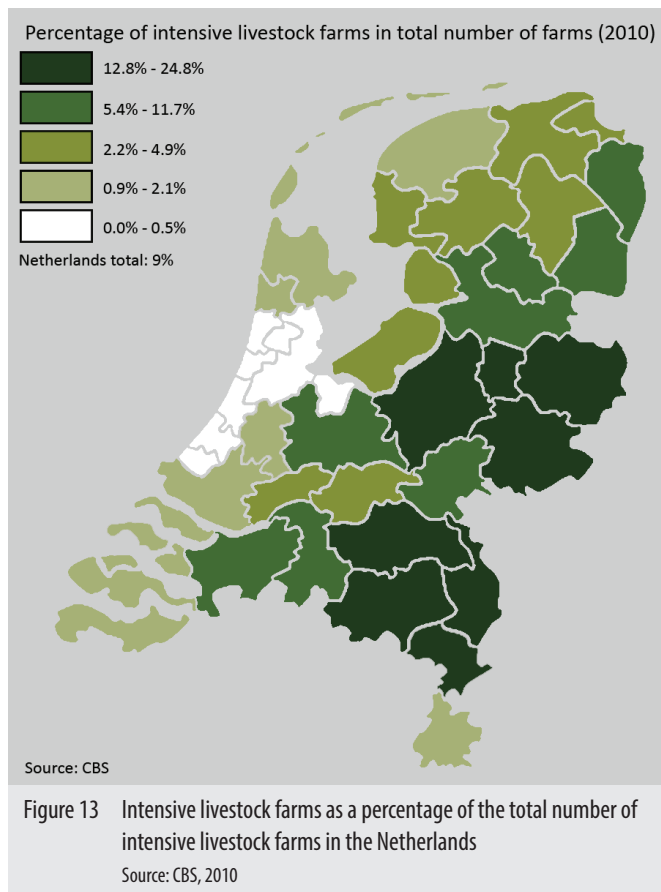**Figure 13**   Intensive livestock farms as a percentage of the total number of intensive livestock farms in the Netherlands
Source: CBS, 2010

not ground-bounded because production takes place in stables. The intensive livestock sector consists mainly of the production of pig, poultry and veal meat. The number of intensive livestock farms is presented in Figure 12, where the relative regional share in the total number of intensive livestock farms in the Netherlands is presented in Figure 13.

Before 1850, almost all production in agriculture took place on sand. At first the main reason for keeping livestock there 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. 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.

Conclusion

In modern agriculture and agribusiness the formation of clusters is important because it generates regional competitiveness. In this paper we identified clusters with the help of two methods:

- ❏ Location quotient: a tool to measure economic strength of a certain industry in a region. A ratio 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 is calculated. 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 we 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 in which regions there are clusters of a certain sector.

According to the location quotient based on number of jobs, the COROP-area that has the biggest share of employees in the agricultural sector is 'Delft en Westland' (LQ: 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: they are specialized in agricultural activities. Again the only COROP-areas located in the most urbanized, western part of the Netherlands, of which the location quotientsare relatively high, are specialized in intensive horticulture (Delft en Westland and Zuid-Oost Holland). Cluster analysis based on number of farms leads to the following results:

- ❏ 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 (Rhine and Meuse) in the Netherlands where the soil type is also suitable for arable farming.
- ❏ Horticultural 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 farming 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 more profitable kinds of agriculture sustainable livestock farming is often not preferred.
- ❏ Intensive livestock farming (pig, poultry and veal meat production) is mainly located in the eastern and southern part of the Netherlands.

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