

## VIII

### DUTCH AGRICULTURE IN THE GOLDEN AGE, 1570-1660 \*

by

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#### 1. Introduction

Over the past decades, scholars writing on Dutch agricultural history have emphasized the important role played by agriculture in the economic boom the Republic experienced after 1570/1580 and, conversely, the way agriculture itself was influenced by economic expansion in this period. For English readers in particular, but for others as well, the image of the agrarian history of the Dutch Republic in recent years has been strongly influenced by Jan de Vries's book, *The Dutch Rural Economy in the Golden Age* (1974).<sup>1</sup> In this book De Vries painted in strong and agile brushstrokes how Dutch agriculture was transformed during this period and opened our eyes to the crucial role of the agrarian sector in the economy of the Golden Age of the Republic. Because of a lack of sufficient and adequate studies, he was forced to arrange the relatively few data he had according to two models which, he said, represented the mainstream developments, on one hand in the coastal provinces, and on the other hand in the inland provinces.

Since then, however, scholars have pointed out that De Vries's distinction between a 'specialization model' and a 'peasant model' is somewhat caricatural and misleading.<sup>2</sup> They argue that De Vries tended to exaggerate the process of specialization of the rural community in the coastal provinces, while at the same time neglecting the role of the inland districts in the 'national' economy. Recently, for instance, Van Zanden has contended that in the fourteenth and fifteenth centuries, when agriculture was orientated towards the urban economy of Flanders, where there was a strong demand for certain special agricultural products, an important basis was laid for the developments that were to take place in the northern provinces after the 1580s.<sup>3</sup> Others, like Roessingh and recently Bieleman,<sup>4</sup> have argued that the rural economy of the inland provinces in fact became much more interwoven with the more urban economy of the coastal districts (especially Holland) than has long been assumed.

For the early sixteenth century, different demographic zones can be distinguished within the territory of the Northern and Southern Netherlands, which contained some of the most, but also some of the least, densely populated areas known in Europe at that time. Blockmans *et al.* have demonstrated that these zones, seen in global terms, formed more or less concentric rings from the highly urbanized coastal area moving out to the inland areas. Whichever criterion is taken – the degree of urbanization, the absolute number of inhabitants, or the inhabitants per km<sup>2</sup> – the same order always comes out.

Let us look at the most urbanized zone, Flanders. There the degree of urbanization as early as 1469 already amounted to 36%: more than one-third of the population lived in towns. Towards the outer zones of this concentric constellation population density decreased significantly. In 1469 one could count as many as 45 persons per km<sup>2</sup> in rural Flanders, and in Holland even 47 per km<sup>2</sup>. In 1573 in regions of the second and third ring, for instance in Brabant, there were as many as 27 persons per km<sup>2</sup> and in 1511 in Friesland, 17 per km<sup>2</sup>. In the countryside of Gelderland only 10 persons per km<sup>2</sup> could be counted, and in Overijssel no more than 8 per km<sup>2</sup>. Drenthe must have had a population density of no more than 6 persons per km<sup>2</sup>.<sup>5</sup>

As elsewhere in Europe, in the Netherlands the 'long sixteenth century' was a period of strong population growth. But compared to European standards, growth here was remarkably strong. At the beginning of this period, within the boundaries of the present-day Netherlands, about one million inhabitants could be counted, and this number increased to 1.5 million in 1600 and then further to 1.9 million by the middle of the seventeenth century.<sup>6</sup> In the coastal provinces especially, the rate of population growth was extraordinarily high. Although growth began in the countryside, later, especially after 1570/1580, it was caused by remarkably strong growth in the towns.<sup>7</sup> Generally speaking, population growth in the inland provinces was much more moderate than that in the coastal provinces. But these were the regions that suffered most from the warfare during the Revolt, especially the southern districts.

Because of this differentiated population increase, the demographic distribution pattern which already existed in the early sixteenth century was enhanced during the 'long sixteenth century'. At the same time, the core of the typical concentric zoning was transferred to the Northern Netherlands, as the northern Dutch towns took over economic supremacy from the Flemish towns.

Scholars writing about the agricultural history of the Netherlands during the Republic usually emphasize the differences in farming and farming developments between the coastal provinces and the interior. They suggest that these are mainly based on differences in the geological and pedological landscapes in the Netherlands, which can be roughly divided into two main groups: a) the Pleistocene landscape of the inland provinces with their 'poor' sandy soils; and b) the Holocene landscape of the coastal provinces. This second group includes the marine-clay soils in the north (Groningen, Friesland) and southwest (Zeeland, northwestern Brabant), as well as a broad zone of peatland with peat and clay-covered peat in between (that is, between the coastal dune area on one hand and the Pleistocene sandy soils of the inland on the other).<sup>8</sup>

According to this view, farming developments in the coastal districts during the 'long sixteenth century' are seen as dominated by important transformations which led to high technological standards and highly commercialized forms of agriculture. In contrast, farming in the sandy regions of the interior is said to have remained backward and, being less commercialized, hardly to have evolved. Cut off as it was from economic stimuli, farming in the interior is said to have remained on a subsistence level.

It is true that the great differences in soil landscapes had, and still have, a great impact on farming types in the Netherlands and that these also influenced the level of productivity. However, to some degree these differences were less important than has often been assumed. Moreover, it has been shown that the wide variety of farming systems in this part of northwestern Europe was, to a great extent, generated by the distance which separated them from their most important markets, namely the highly urbanized regions of Flanders and (later) of Holland. In our view the variety in farming systems was, to a considerable degree, the result of the Von Thünen field of force which crystallized out in the early European agri-economy, the centre of which, especially after 1580, was the emerging urban economy in the southwestern and western coastlands.<sup>9</sup> In fact, one can discern a typical interference between the rigid pattern of the Von Thünen model and the underlying and complex pattern of the pedological landscape. In this way the very pattern of population distribution described above forms the Boserupian framework that helps us to explain this diversity of agricultural systems.<sup>10</sup> It makes understandable not only the differences between the farming systems in the coastal provinces and those in the interior, but also further differences within these regions themselves.

## 2. Coastal provinces

In the Late Middle Ages and early sixteenth century the physical situation in the coastlands scarcely looked promising. In the north, as in the southwest, a considerable area of land had vanished into the sea, because of heightened storm-flood activities during the Late Middle Ages. The situation in large parts of the peatland areas of Friesland, Utrecht and Holland (especially the northern part of Holland) were hardly more auspicious. After the occupation of the peatland wilderness during the High Middle Ages, a process of bedding down and oxidation of the peat caused the surface level of the land to sink two metres or, in some places, even three metres or more.<sup>11</sup> Coupled with this, the lakes formed by the dredging of peat became a real threat to the remaining peatland. And so, as elsewhere in Europe, the demographic crisis of the mid-fourteenth century caused newly won and marginal farmlands to be abandoned, and developments in these Dutch regions could quite easily have gone in the same downward direction.

But they did not. The reason was, as Van Zanden has recently argued, that during the Late Middle Ages, these regions became orientated towards the flourishing urban economy of Flanders, which did not suffer (or hardly so) from the crisis as other parts of Europe did.<sup>12</sup> During the sixteenth century, farmers could benefit from strongly increasing prices, especially after the 1570/1580s. An important role in this process was played by the famous Baltic grain trade. The amount of grain imported into Amsterdam increased from 3,000 lasts in 1460, and 10,000 lasts in about 1500, to more than 50,000 lasts during the first half of the seventeenth century.<sup>13</sup> Though not all of this grain remained here, some authors have estimated that the amount which did, was sufficient to feed a significant part of the Dutch population.<sup>14</sup>

Because of this supply of relatively cheap grain, Dutch farmers had the opportunity to switch over to the production of other agricultural products with a higher added value. While everywhere else in Europe prices of grain rose much faster than prices of livestock commodities, Dutch farmers could benefit from the reverse, i.e. prices of livestock commodities rose more quickly than those of grain. At the same time the price of all kinds of special arable products also increased sharply.

In the northern marine-clay area, economic expansion led to important changes in the farming system, as these were

coupled with a process of arabilization. In this process cereal cropping became predominant. It was the response of farmers in this area to the Von Thünen field of force by which they were influenced. Faber has shown that in this region, after the early sixteenth century, arable area was continually enlarged at the expense of the area under grass.<sup>15</sup> Some authors claim that the farmers' eagerness to plough up grassland was so great that the Frisian authorities tried to curb it.<sup>16</sup>

At the same time a system of ley farming was introduced. Under this system, certain parts of farmland were shifted every now and then from arable to grass and vice versa, to the benefit of crop yields. Many seventeenth-century lease contracts from the Groningen marine-clay region contain a general clause that the tenant was free to use the farmland at his own discretion: 'to plough, to make hay, or to pasture'.<sup>17</sup> It seems that to turn arable into grassland, farmers began to use a mixture of hayloft sweepings and white-clover seed.<sup>18</sup> This white clover must have been an important factor in improving the productivity of the grassland. From leases like these it can also be deduced that, at the same time and for the same reason, more labour was invested in the draining of grassland.

Although arable farming became more important, cattle breeding nevertheless remained important in the farming system as a whole, for several reasons. According to information based on probate inventories from the northern part of the Leeuwarderadeel district, it appears that there was even a slight increase in the number of cattle. However, while the number of dairy cows stayed the same or even decreased, the number of young cattle increased. In percentage terms this was an increase of 28% in the period 1566-1574, to one as high as 40% in 1677-1686 and, afterwards, even up to 47%.<sup>19</sup> Like their colleagues in the grassland district of Friesland, arable farmers in the northern clay region got an increasing part of their farming revenues from cattle breeding, providing dairy farmers in Holland with young milk cows or down-calving heifers.

As the process of arabilization continued, the need for draught power increased. This is reflected in data from probate inventories from the same part of the Leeuwarderadeel district, which show that the average number of horses and colts rose from 2.4 per farm in the years 1566-1574 to 4.2 in 1677-1686.<sup>20</sup>

As far as the arable is concerned, at first the cultivation of barley still dominated. However, during the late sixteenth and the seventeenth centuries this crop gradually lost some of its importance. At the same time wheat became more important, as did rye and, especially, peas and beans.<sup>21</sup> These pulses were particularly important because of their ability to fix nitrogen. The partial shift from barley to wheat has been explained as a stronger market orientation on the part of Frisian arable farmers. A Frisian farmer, Rienck Hemmema, who very conscientiously kept a diary over the years 1569-1573, even sold as much as 92% of the wheat he produced. At the same time he bought rye to use in his own household. From the barley he cultivated, he sold only 63%. The rest of it he probably used as fodder.<sup>22</sup>

It seems that in about the mid-seventeenth century coleseed (*Brassica napus*) was the dominating oleiferous crop, having ousted rapeseed (*Brassica rapa*) in the foregoing period. Together, these crops must have covered 5% or even more of the arable land in Friesland at this time.<sup>23</sup>

Stimulated to increase their production, Frisian farmers not only paid more attention to their farmland by improving drainage, but also began to manure their land more heavily. From Hemmema's diary we know that he bought great quantities of night soil in the nearby town of Franeker. Also, to more efficiently produce farmyard manure, he began to build dung channels in his cowhouse.<sup>24</sup> Again, in a chronicle written by a farmer from Groningen about 1590 there is mention of increasing interest by farmers in the preparation of manure.<sup>25</sup> In 1610, the States of Friesland went so far as to forbid the use of (dried) manure as fuel and the export of it.<sup>26</sup> As a result, and seen in a contemporary European context, yields were extremely high and already up to a level that could hardly be improved by technological innovations until the late nineteenth century.<sup>27</sup>

Arable farmers in the southwestern marine-clay area had, in fact, been farming in the centre of the Von Thünen field of force ever since the Late Middle Ages. The character of farming here must have been very similar to the intensive way of farming in Flanders, as this developed in the Late Middle Ages. Already by then they must have enjoyed the advantages of having a nearby market for industrial and other special crops. And so, being arable farmers, they became particularly orientated towards the cultivation of special crops such as flax, as well as cereals like wheat. Other crops were also known, such as pulses, onions and all kinds of condiments, like coriander and horseradish. Teasel was produced for use in the textile industry. These same crops were also found in the newly reclaimed marine-clay polders of nearby northwestern Brabant.<sup>28</sup> The high level of efficiency in farming in the Zeeland region can be inferred, for instance, from the fact that in the first decades of the seventeenth century the leasing of special ready-for-sowing land to specialized 'flax farmers' had already become quite general.<sup>29</sup>

Granting the importance of cereals and an industrial crop like flax, no other crop is so especially identified with farming in the Zeeland region as madder is. The cultivation of this crop (together with that of flax) strongly influenced

the farming system as a whole in this area. It is believed that cultivation of madder (an important source of dyestuffs) had its first boom in the thirteenth and fourteenth centuries.<sup>30</sup> Recently it has been shown that in the early fourteenth century in the nearby marine-clay polders in Flanders, between Ghent and Bruges, as much as 15% of total arable land was sometimes planted in madder.<sup>31</sup> Afterwards, the cultivation of this labour-intensive crop moved further north, and by the fifteenth century it was being cultivated in the whole of the southwestern marine-clay area. By then large quantities of madder were being exported to the southern and eastern ports of England too. The Italian diplomat Guicciardini wrote in 1567 that the cultivation of madder in Zeeland was so important that this region could supply the whole of Europe with it.<sup>32</sup> And although the expanding cloth industry in Leiden after 1580, as well as in other towns, must have stimulated this cultivation, it is believed that England still remained the most important customer.

A special aspect of the expanding economy of the 'long sixteenth century' – the sophistication of commercial capitalism and the way the agricultural sector became interwoven with it – was the development of a permanent staple market for madder in Rotterdam, as a complement to its primary production and processing. It had proved too difficult for the small madder kilns owned by the farmers, which usually produced small quantities of widely varying qualities, to meet growing demand. The traders at the Rotterdam staple market could stock a great variety of batches in large quantities and therefore could meet any demand at any time.<sup>33</sup> Ever since its emergence in the late sixteenth century, this staple market had absorbed the supply which previously had gone to small regional markets in towns like Middelburg, Veere, Zierikzee and Dordrecht.

In between these main arable farming regions in the north and in the southwest, and bordering the Pleistocene interior, is a broad zone of peat and clay-covered peat soils in Holland and Utrecht, as well as in Friesland, Groningen and Overijssel. This area was, for a long time, known pre-eminently as a cattle-breeding and dairying area. However, in the Middle Ages, after this peat wilderness had been occupied, arable farming must still have been possible on top of this drained moorland. However, gradually, because of drainage and cultivation, a process of bedding down of the peat layer began and, consequently, the surface level began to sink. Arable farming became ever more difficult. This caused farmers to shift increasingly to cattle farming.

This process of changing over from an arable-orientated system of farming to one which was more orientated towards cattle breeding and dairy farming, a process which had already started in the fourteenth and fifteenth centuries, was given added impetus by the outlet for 'luxury' livestock products to the flourishing urban economy in the Southern Netherlands, i.e. Flanders.

In the late fifteenth and early sixteenth centuries, according to the *Enquete* (1494) and the *Informacie* (1514) (both village-by-village surveys of economic conditions in Holland meant for taxation purposes), cattle farming had not yet reached the proportions which later on became proverbial. In Holland, the largest holdings of cattle consisted of no more than 10 to 12 animals, only a few farmers having more. Average holdings amounted to only 4 to 6 cows, while in Friesland holdings were hardly any larger.<sup>34</sup> Nevertheless, in this period important quantities of dairy products and cattle were already being exported to Germany and Flanders.

However, because of the relative price movement over the 'long sixteenth century', and partly because of changing physical soil conditions, farming here became more specialized and more labour intensive. Farmers in the Frisian grassland districts who still had some arable land, gave up arable farming and switched to cattle breeding and dairy farming. At the same time, the number of cattle rose substantially. For instance, in the southern part of the Leeuwarderadeel district, the total number of cattle per farm increased from about 14 in 1566-1574 to 24 in 1677-1686. This growth meant an increase in the number of dairy cows from an average of 10 to 15. At the same time, the percentage of young cattle in this district rose from 26% to 38%.

These figures show that Frisian farmers in the grassland region, in addition to dairying (i.e. butter production), were now concentrating on breeding cattle. They became important suppliers of milk cows for the highly specialized dairy regions more towards the centre of the Von Thünen field of force, in Holland.

There, especially in the northern part of Holland, stimulated by the 'price revolution' for livestock products, farmers became especially orientated towards the production of whole-milk cheese. Before, even as early as the fifteenth century, large quantities of butter were exported. Toll records from the town of Kampen from 1440 show that the revenues from butter from northern Holland which were transported along the IJssel River up to the German Rhineland were still double those from cheese. But later on, cheese became more important than butter, as dairy production in northern Holland shifted to cheese.<sup>35</sup> It is quite possible that, through improvements in production techniques and the care with which cheese was prepared, it became more suitable for export and so new export markets could be won. About the mid-seventeenth century, almost all the cheese which was exported from the town of Hoorn went to France and southern Europe.<sup>36</sup> France especially became an important market for the cheese farmers of northern Holland.

In the southern part of Holland, in the Rhineland area and in the Delfland area, however, dairy farmers applied themselves to the production of butter and skimmed-milk cheese. Butter from these regions was even more highly valued than that from Friesland.<sup>37</sup> While Frisian farmers, somewhat further away from the centre of the Von Thünen agri-economic field of force, cattle breeding had probably become more important than butter production by the mid-seventeenth century. The town of Leiden was known as the most important butter market in Holland, and the English ambassador Sir William Temple wrote: 'They [Dutch dairy farmers] send abroad the best of their own butter, and they buy the cheapest out of Ireland or the north of England for their own use.'<sup>38</sup> But even so, according to Boekel, the export of butter was exceeded by that of cheese.<sup>39</sup>

While Dutch towns expanded, more farmers in the direct vicinity of towns applied themselves to producing and selling milk for household consumption. For instance, about 1660, in the Amstelland region, south of Amsterdam, newly-built farmsteads were especially equipped for the production and daily delivery of household milk in that town.<sup>40</sup> Hardly any young cattle were to be found on farms of these so-called *zoetboeren*. These farmers tried to keep up their production throughout the year by buying milk cows from everywhere possible. Similar dairy farms were to be found in the area north of Amsterdam and around other large towns. In 1677, the bailiff of Waterland wrote that hardly any farmers in his region were making cheese or butter any longer, since they had all gone over to the production of household milk to be sold in Amsterdam.<sup>41</sup>

The processes of specialization and intensification in cattle farming must have been accompanied by a remarkable increase in production and productivity. And attempts by farmers to improve the productivity of their herds led to a growing demand for oilcakes for use as fodder. The more rapid increase of prices of dairy cattle compared to prices of their principal products probably reflected the success of farmers' efforts to improve the productivity of their animals, as De Vries concluded.<sup>42</sup> Still it is very difficult to give any precise data on this matter. However, figures given by Guicciardini (1567) provide an impression of the level of production in the dairying districts. According to his data, milk yields in the northern Holland village of Assendelft must have already been as high as 2,000 litres per year.<sup>43</sup> About 1660, cheese yields per cow in the Beemster (Holland) were almost the same as those in the early nineteenth century, when it was very high indeed and an equivalent of a milk production of over 2,000 litres per cow per year.<sup>44</sup> Increasing milk production must have been an important stimulus for the introduction of horse-driven churn mills in Friesland. The earliest mention of this rather sophisticated piece of equipment dates from about the mid-seventeenth century.<sup>45</sup>

*Enquete* and *Informacie* tell us that by the early sixteenth century, the fattening of beef cattle was already an important source of income in several places in the northern part of Holland.<sup>46</sup> At first these activities must have been directed, to a great extent, towards answering a demand for meat coming from the flourishing towns of the Southern Netherlands.<sup>47</sup> However, during the course of the sixteenth century, especially after 1580, demand from the towns in the northern coastal regions became increasingly important. In addition, there was growing demand for beef to be salted for provisioning the navy and the commercial fleet, and for export to the colonies. In 1662, Melchior Fokkens wrote that for the six VOC vessels which usually left Amsterdam each year for the East Indies, about 2,000 oxen were to be slaughtered.<sup>48</sup>

By the end of the fifteenth century a flow of oxen from Denmark and northern Germany was satisfying the need for beef in the Netherlands. And while cattle farmers in Holland gradually specialized in producing butter or cheese, their own production of young cattle (and therefore of oxen) decreased. This, together with a growing demand for conserved meat, explains the rapid increase in imports of oxen from Denmark during the sixteenth century. Although the warfare of the Dutch Revolt caused a temporary setback in the 1570s, trade soon recovered. All this caused the primary production of beef cattle to shift more and more to the outer fringes of the northwestern European agrarian economy then developing.<sup>49</sup>

During the first decades of the seventeenth century Denmark exported some 50,000 oxen, of which usually 60%, but sometimes even more than 80%, were driven to the Netherlands, especially to Holland.<sup>50</sup> As well as oxen coming overland, some 8,000 to 10,000 were sent by ship from Denmark to Holland.<sup>51</sup> As the demand for cattle for slaughter increased, some regions in the eastern inland provinces of the Netherlands, like Drenthe, also provided a remarkable number of oxen. Taking these numbers together, it is clear that during the first half of the seventeenth century, at least 50,000 oxen came to northern Holland each year to be fattened, and this region became the most important fattening area in Europe.<sup>52</sup>

Various historical sources indicate that by the early sixteenth century, in the large zone of peatland in Holland and Utrecht, the growing of hemp must have been of widespread importance.<sup>53</sup> During the 'long sixteenth century' an overall expansion became apparent, especially in the Alblasserwaard, the Lopikerwaard and the Krimpenerwaard.

This, in fact, is the region where the river-clay soils enter the peatland zone. However, strongly related to the keeping of cattle (to produce manure) and the production of whole-milk cheese, the cultivation of hemp must be seen as a relic of arable farming that had once been widespread, and a form of specialization within an arable farming system.

Although by the early seventeenth century this area was already a grassland region, hemp, heavily manured as it was, was mainly cultivated in small gardens near the farmhouses, on specially prepared, somewhat higher grounds.<sup>54</sup> In 1684, in the parish of Laag-Blokland, in the Alblasserwaard (an area of 352 *morgen*; 1 *morgen* = 0.85 ha) an area of 22 *morgen* or 6%, spread over 22 farms, was cultivated with hemp.<sup>55</sup>

After harvesting, the hemp was prepared during the winter months on the farms and was then sold to rope-yards in the towns of the region. What is remarkable is the sophistication in cultivating and harvesting techniques that developed. First, the male plants of this dioecious crop were harvested. These produced the finer qualities of fibre. Some weeks later, the female plants were harvested. These plants gave the coarser fibres. This system meant that a wide range of different and well-distinguished qualities could be produced for the many different ways the fibres to be used. The finest qualities, after having undergone several preparatory treatments, were used to spin strings for weaving canvas. Several other qualities of coarse hemp fibres were used for making fishing nets and ropes for ship rigging. As ship building flourished and maritime and fishery activities expanded, the demand for these products increased and so did the cultivation of hemp.

In several towns in Holland substantial numbers of rope-yards were established. As early as 1570, Guicciardini wrote that the prosperity of towns like Woerden and Oudewater was completely dependent on this industry. He wrote that 'in dese twee steden bijkans alle netten ende koorden die de Hollanders en de Zeelanders tot hare menichvuldighe visschery daghelijckcs gebruycken, ghemaectt worden' (Almost all the nets and ropes used by the fishermen in Holland and Zeeland were made in these towns).<sup>56</sup>

Near the centre of the Von Thünen field of force, other special crops such as hops were still to be found. While in the rest of the river-clay area the mainstream form of agriculture still was the cultivation of several cereals, in the westernmost part, in the Bommelerwaard, which was easily accessible by ship, the cultivation of hops became very important.<sup>57</sup> Hops growers here must have profited from the growing beer production in the Dutch beer towns. Although the old beer towns of Haarlem, Delft and Gouda were outshone by Amsterdam and Rotterdam, the demand for hops increased, not only to quench the thirst of the local town population, but also to supply the growing navy and merchant fleet and for export to the East and West Indies.<sup>58</sup> This hops region in the western part of the river-clay area formed a whole with similarly orientated area along the Maas River, formed by the Land van Heusden en Altena, and the 's-Hertogenbosch region. Here, too, the growing of hops had become important, although it is likely that the hops growers here were more orientated to the brewing industry in the city of 's-Hertogenbosch. In 1698, Blankaart wrote in his *Kruidboek* that in these regions 'entire fields' (*heele velden*) were under hops.<sup>59</sup>

The growth of horticultural centres in several different places in Holland was stimulated by strong urbanization, a relatively high standard of living, and the development of a well-equipped and sophisticated transport system. In contrast to fruit farming, which in some regions emerged as firmly attached to standard farming, horticulture began in the vicinity of towns. The first centres of professional market gardening developed near Leiden and Delft. Around Leiden, Leiderdorp emerged as an important centre. However, in what was later to be the well-known Westland district, hardly any trace of horticulture was to be found at this time. This was also true of several regions in northern Holland which later on were to become important as market-gardening centres.<sup>60</sup>

Tax registers from 1630 show that horticulture had experienced a boom. Four important centres can then be distinguished. At first the traditional centres around Leiden and Delft predominated, but newly emerging centres were the areas around Langedijk and Enkhuizen. The Langedijk, north of Alkmaar, became known for its onions, canary seed, mustard, and coriander seed, as well as a variety of roots. In the Enkhuizen area, in the densely populated district called De Streek, the growing of vegetables, especially cabbage and carrots, was alternated with other arable crops. Velius, a chronicler from Hoorn, claimed that many pastures had been transformed into gardens because the soil there was extraordinarily well suited to the Hoorn carrot, or yellow root.<sup>61</sup>

In Beverwijk and Heemskerk, market gardening emerged especially after 1610. By the mid-seventeenth century, the secretary of Beverwijk described vegetable growing as an activity in 'daily increase'. These areas enjoyed direct access to Amsterdam across the IJ, and kept up a regular schedule of market boats between the two points by importing night soil and exporting garden produce.<sup>62</sup>

Two villages became well known as centres for arboriculture. The first, Aalsmeer, also produced several kinds of fruits, especially strawberries. Regular barge services delivered these products several times a week to Amsterdam. The other, Boskoop, had about twenty tree nurseries in 1612, which exported their products to all parts of Europe. Across the Zuiderzee, in Friesland, the district of Barradeel (the villages of Berlikum) became an important centre for

market gardening.<sup>63</sup> In time other new specialized horticultural centres like these came into being, well situated in relation to a rapidly expanding town like Amsterdam.

This short survey of the emerging horticultural sector in Dutch agriculture would not be complete without mentioning the cultivation and trade in bulbs, especially tulips. During the first decades of the seventeenth century tulips became the pre-eminent flower of fashion. Prices increased and trade in bulbs became highly speculative. The years 1636-1637 became notorious when there was a full-blown boom on the stock exchange, 'tulpomania'. This was followed by a crash, but although prices fell dramatically, the trade itself survived. After being stripped of its excesses, bulb cultivation and trade remained important as a speciality for a small group.<sup>64</sup>

All this growth in the various sectors of agriculture in the coastal districts led to methods of production which became ever more labour- and capital-intensive. The growing profitability of agriculture can be seen in rapidly rising rents, especially after 1580.<sup>65</sup> Increasing profitability can be deduced not only from rising rents and land prices, but also from investments made in improving farmsteads and farmland. A well-known example of the latter is the extent to which money was invested in numerous land-reclamation schemes. During the first half of the seventeenth century, in Holland and Utrecht alone the area of reclaimed lakes was about twelve times as high as in the preceding half century.<sup>66</sup>

The flourishing of the agricultural economy can also be seen in the architecture of farmsteads. In the sixteenth century, in the coastal region, the use of wood and loam gave way to bricks, and reed and straw were replaced by tiles.<sup>67</sup> At first, farmers were content to enlarge the existing types of farmsteads. From probate inventories in the Frisian district of Leeuwarderadeel it appears that the traditional Frisian farmstead, the so-called *langhuis* (= long house), had an average of about nine *vakken* or sections. By the mid-sixteenth century, the need for more space had forced farmers to enlarge their farmsteads by extending the number of sections. Though by the 1570s half the inventories listed separate dairies, hay was still being stored in a separate haystack.<sup>68</sup> The elongation of farmsteads, however, did not solve the problem of the lack of storage space for bulky commodities. Therefore, just before 1600, there was an attempt to find a more efficient type of farmstead, by bringing livestock and fodder together under one roof. With this fundamental reshaping of the farmstead in Friesland, a completely new type came into being. Because of its silhouette, it is known as the *kop-hals-romp* (head-neck-rump) type, the head holding the cellared living quarters and the rump the aisled barn, with crops being stored in the middle. In the middle of the seventeenth century this type of farmstead spread into the western part of Groningen and further eastward. Under the same circumstances, in the northern part of Holland the so-called *stolp* came into being about 1600, in which all farming functions were grouped together under one pyramidal roof, with the haystack in the middle.<sup>69</sup>

### 3. The inland provinces

About 40% of the territory of the present Kingdom of the Netherlands has Pleistocene sandy soils. Traditional farming here must be understood as regional variations on the theme of open-field farming as was practised in several other parts of northwestern Europe. Although there were important differences between regions, all farmers in these regions were, in fact, farming quite near the centre of the northwestern-European agri-economic field of force. Globally speaking, we can distinguish three major regions, each with its own characteristic population density, according to its place in this constellation. First there was the most southern and most densely populated zone, formed by the sandy soils of North Brabant and North Limburg, linked with corresponding regions on the southern side of the present-day national border. Then, as a second zone, were the sandy districts in the provinces of Utrecht, Gelderland (the Veluwe and the Achterhoek) and Overijssel (Salland and Twente). Finally, the third main zone was the sparsely populated province of Drenthe (together with the Westerwolde district, in the province of Groningen). Recently it has become clear that, in the same order, farming systems in these zones showed an increasing rate of intensiveness correlated with the distance which separated them from highly urbanized Flanders and Holland.<sup>70</sup>

Until far into the seventeenth century, farming in Drenthe kept its labour-extensive character:<sup>71</sup> a very low population density of less than 7 persons per km<sup>2</sup>, and large, broad-based farms, with a remarkably high number of cattle and horses. Socio-economically, rural society here was hardly differentiated. Compared to the number of larger farmers, the cottagers, artisans and shopkeepers still formed a minority. Because of the extensive character of farming, there was only limited employment for groups like these. An important reason for this extensive character of farming, besides the extremely poor soil conditions, was the great economic distance which separated this region from the economic centre of northwestern Europe at that time. Because of this, even during the economic boom of the early seventeenth century, prices of rye here were about 10% below the level on the grain exchange in Amsterdam (about

130 km away, as the crow flies). Later on, this difference amounted to as much as 30%.

In the early seventeenth century, on a so-called *vol bedrijf* (full farm, i.e. a farm with full rights in the commons), which held about 32 *mud* (. 8.6 ha) of arable land in the open field, an average number of 24 (old and young) cattle were kept.<sup>72</sup> At the same time, farms like these usually possessed four adult horses. The significance of this rather high complement of horses, however, lay less in the providing of draught power than has been believed. Just like the farmers on the Geest of northwestern Germany, farmers in Drenthe were involved in an interterritorial division of labour in the breeding of horses. Foals born in the early spring were sold to farmers in the clay districts of Friesland and Groningen, where they were reared and trained, and then sold again as work horses.

In cattle breeding as well, Drenthe farmers became involved in an interterritorial division of labour. To meet the increasing demand for meat, farmers enlarged their herds, which included a high percentage of oxen. After three to five years, these oxen were driven to the rich pastures of the coastal provinces, especially to Holland, where they were fattened during the summer season and then sold for slaughter in the autumn. It has been estimated that during the first half of the seventeenth century Drenthe farmers were able to export some 3,000 to 5,000 oxen every year.

Stimulated by the expansion of the textile industry in Leiden and other towns after 1580, the demand for native wool, so-called *bruierwol* or heather wool, also increased. This caused farmers to extend their flocks of sheep, which were then kept primarily for the production of wool. This growth continued up to about 1660 and can be illustrated by the figures mentioned in a set of local by-laws for the parish of Ruinen. In 1561, these by-laws allowed farmers to keep 35 cows as well as 60 sheep. However, after an adjustment to the by-laws in 1640, the number of sheep was raised to 85, while the number of cows remained the same. To allow better use of the often extremely wet communal wastelands, farmers began improving them by cutting drains.

Notwithstanding the important place livestock had, arable farming was still the pivot on which all farming activities in Drenthe turned. However, although a certain individualization showed up in the use of meadow land in the stream valleys because of increasing land prices, the communal use of open fields remained very strong in this period. This regime still regulated a rigid cropping system, which at the same time enabled the community to use the open fields for grazing during a large part of the year.

Communal grazing of open fields still played a major role, not only as a badly needed feed supplement for farm animals, but perhaps even more, as a way of maintaining the fertility of the arable land. It seems that the system of sod manuring played only a minor role, not becoming important until after the early eighteenth century.

Winter-sown rye was the most important 'cash' crop. Also, it appears that, in the course of the sixteenth century, barley and oats were increasingly being replaced by spring-sown rye. However, because of the extensive character of farming, the yields of these crops were very low. Early seventeenth-century records speak of a yield ratio (seed sown to grain harvested) for winter-sown rye of 1:3, or 1:4 at best. However low these yield ratios may seem, they form part of a continuum which, further towards the fringes of northwestern Europe (northwestern Germany and Denmark), led to figures which were even lower.<sup>73</sup>

Although in general, farming in Drenthe still had a very labour-extensive character, in the north, near the town of Groningen, an intensive, almost horticulture-like type of farming began to flourish, namely the cultivation of hops. There, the village of Peize became almost entirely dependent on this high-risk crop. A lot of their hops were sold to breweries in the town of Groningen, in return for which the hop growers got the city's night soil. However, hop cultivation in northern Drenthe not only answered the demand from the Groningen breweries, but farmers also exported their hops elsewhere, for example to East Friesland and to the earldom of Bentheim.<sup>74</sup>

In spite of these developments during the first half of the seventeenth century, farming in Drenthe kept its extensive character ? of necessity, one may say. However, in the sandy regions closer to the centre of the Von Thünen field of force (i.e. Salland, Twente, the Achterhoek, the Veluwe and the sandy parts of the province of Utrecht), the sixteenth-century price revolution induced a process of intensification and specialization. This can be deduced from a rather spectacular decrease in the number of farm animals. As late as the early sixteenth century a very high complement of farm animals was still to be found all over the Veluwe region. The numbers of horses and sheep were much higher than they were to become later. According to a census held in 1526, the total number of horses was as high as 13,000, while in the early nineteenth century, in 1824, only 6,000 horses were to be counted. Roessingh has shown that the decline must, to a great extent, have already taken place before 1650 and must have been accompanied by a remarkable drop in the number of horses on each farm.<sup>75</sup> Just as in Drenthe and in Salland (Overijssel), the Veluwe farms were also rather large, if measured by the number of horses: about 75% of all horse keepers possessed three or more (adult) animals.

On the other side of the IJssel River, in Salland, as many as 82% of the farmers still had three or more horses in 1602; 54% of them even had four or more.<sup>76</sup> By 1650, in the Veluwe, the number of farmers with three or more horses had already dropped to about 40%, and by 1807 to only 17%. This remarkable decrease in the number of



horses can only be satisfactorily interpreted by accepting that there must have been a fundamental change in the economic niche of horses on these farms. Just as it still was in Drenthe, in the Veluwe and also in Salland, an important function of horses must have been for breeding. And it is this aspect of horse keeping that must have lost its meaning in the sandy regions of Gelderland and Overijssel during the 'long sixteenth century', while it maintained its importance in the more remote Drenthe region.

During this period there must also have been an important shift in the keeping of sheep and their role in the farming system of the Veluwe. While in 1526 111,000 sheep were counted, by the early nineteenth century this number had decreased to about 40,000, a decline which, to a large extent, must have taken place before 1650.<sup>77</sup> The function of sheep keeping during the Late Middle Ages and the early sixteenth century must have been for wool production, rather than for the production of manure, as it was later on.<sup>78</sup>

In spite of growing demand for wool after 1580, farmers here reduced their flocks of sheep. The decline in the number of sheep (and horses) was a symptom of the fact that farming in the Veluwe (as in the other sandy parts of the central Netherlands) was becoming less extensive. It seems that sheep keeping and horse breeding were activities that were appropriate to the more remote zones of the Von Thünen field of force, like Drenthe and Westerwolde.

The loss of these farming activities in the sandy regions of the central Netherlands was part of a process in which farmers here turned to the production of cereals, i.e. a process of arabilization. There are also several indications that certain communal aspects of farming in the sandy regions of the central Netherlands, such as communal grazing on the stubble of open fields, were cut back, although they still survived (of necessity) in the more remote Drenthe region, as we have already seen.

An important feature in the process of arabilization more land into cultivation was the spread of buckwheat. As early as 1390, buckwheat was mentioned as a crop in the accounts of the Bornhof poorhouse in Zutphen. This is the earliest record of buckwheat in the Northern Netherlands.<sup>79</sup> Although it seems that the cultivation of buckwheat in the Veluwe (as in the Achterhoek) in the fifteenth century had already reached a certain scale, it expanded even more afterwards. According to the records of a grain search in 1566, the cultivation of buckwheat must have been quite important then, as was that of rye and also barley. Later on, in the early nineteenth century, in the parishes of the central and western Veluwe region, some 40 to 50% of the sown arable land appears to have been sown with buckwheat. In Utrecht and in a small sandy region southeast of Amsterdam, the Gooi, the figures were sometimes even higher.<sup>80</sup>

It seems that the expanding cultivation of buckwheat was at the cost of the cultivation of mixed crops of oats and barley, which were especially used as animal fodder. To compensate for this, cultivation of spurry and vetch increased at the same time. Several passages in local by-laws indicate that the cultivation of turnips as an aftercrop also became more important. Both the cultivation of buckwheat and aftercrops brought an end to the collective regime on the open fields in these regions during the sixteenth and seventeenth centuries.<sup>81</sup>

A typical example of the intensive character of farming in the western parts of the Veluwe during the first half of the seventeenth century is the emergence of the cultivation of tobacco.<sup>82</sup> At first a sort of buffer between a growing demand and the rather irregular supply from the West Indies, the inland cultivation of tobacco became really important after 1635. The rapid diffusion of tobacco growing in Utrecht and Gelderland in that period was stimulated, to a great extent, by a system of sharecropping. Several techniques from the already highly developed and sophisticated horticulture, such as the use of hotbeds to grow seedlings early in the season, were also applied to the cultivation of tobacco. About 1660 special wooden drying sheds were built for drying the leaves and this, too, appears to have been a Dutch innovation, and was in general use prior to 1690.

The way tobacco cultivation was introduced and spread in the early seventeenth century, as a joint venture between merchants and farmers, is also a typical expression of the commercial capitalist system of the time. It is a fine example of the interdependence in the Dutch Republic between the rural community in these regions and urban-based manufacturing and trade. About the middle of the seventeenth century tobacco cultivation was to be found near several small towns like Amersfoort, Nijkerk, Wageningen, Arnhem and Rhenen.

A remarkable boom in reclamation activities in the Veluwe area in the decades of the mid-seventeenth century indicates that agriculture in these sandy regions was going through an expansionary period.<sup>83</sup> Certain regulations in by-laws from the parish of De Lutte (near the town of Oldenzaal), in the Twente district, indicate that here, too, increasing farm production necessitated larger farm buildings. These by-laws suggest that the length of farmsteads here increased from about 12 metres to 18 or 24 metres.<sup>84</sup>

Hardly anything is known about farming in the sandy soils of the present-day province of North Brabant. To get an idea, however, it is useful to look across the present national border as far as Flanders. If we put the Drenthe region with its very low population density at one end, we then see densely populated Flanders at the other end of a range

of sandy regions with increasing population density.

By the middle of the fifteenth century (1469) the Flemish countryside already had as many as 45 persons per km<sup>2</sup>.<sup>85</sup> These extremely high figures occurred in a rural community which in socio-economic respects was already highly differentiated. The numerous small and very small farms were worked with an extremely high input of labour. By about the middle of the sixteenth century half the farms in Flanders had less than one hectare of farmland.<sup>86</sup>

The cultivation of several kinds of industrial crops, especially flax, was one of the main elements of farming in Flanders. On small farms, flax cultivation was just within or just over the bounds of what was technically possible. Besides a very intensive method of tillage, successful flax cultivation required heavy manuring.<sup>87</sup> This heavy manuring was made possible by the introduction of a system of permanent stall feeding. This in turn required animals to be fed with fodder, and it was therefore during the second half of the fifteenth century that turnips began to be cultivated as a fodder crop. At the end of the sixteenth century, clover came into use, but it was not until the late seventeenth and the eighteenth centuries that its use became generally widespread.<sup>88</sup> As a result productivity was very high indeed. On his journey through Flanders and the Waas country (the region around Ghent and Antwerp) in 1644-1645, Sir Richard Weston was astounded by this high productivity. In spite of the 'barrenness of the soil', which in an uncultivated state grew only heather and broom, yields were as high as in the marine-clay districts, or even higher, he wrote.<sup>89</sup>

The high productivity of Flemish agriculture was to a great extent based on intensive tillage of arable land, not only for the cultivation of flax but also for several sorts of cereals. Spade cultivation instead of ploughing, as was done on the smallest farms, was a precondition for the relatively large area of flax grown on these farms. In order to achieve better drainage, winter-sown grain crops were cultivated in special beds. Sometimes even spring-sown crops, such as oats, were cultivated that way.<sup>90</sup>

Recently, remains of similar forms of *beddenbouw* (a sort of ridge-and-furrow system) have been found in the sandy parts of present-day North Brabant.<sup>91</sup> This finding makes it clear that here, also, a lot of farm labour had been applied to improve the conditions under which crops were cultivated. It is clearly an aspect of a farming system that at an early stage was based on a high input of labour, coupled with a high population density. At the end of the fifteenth century Brabant already had as many as 27 persons per km<sup>2</sup>, a lot fewer than in Flanders, but at the same time, quite a lot more than in other sandy regions of the Northern Netherlands.<sup>92</sup>

Just as in the other sandy regions, rye in Brabant was also a very important crop, alongside barley and oats. However, in the early sixteenth century, buckwheat too seems to have been important, especially along the northern fringes of the sands of Brabant. It appears that this crop gained in importance during the second half of the sixteenth and the seventeenth centuries. In lease payments in kind, the portion of buckwheat increased throughout that period, and by the mid-seventeenth century it had become more important than barley.<sup>93</sup>

It is obvious that communal grazing of the stubble after harvest, as practised in Drenthe and the central Netherlands, had here in a much earlier period gone beyond the bounds of what was possible. The cultivation of aftercrops had become an indispensable part of crop-rotation systems. By far the most important aftercrop in Brabant was spurry.<sup>94</sup> The introduction and extension of this aftercrop made North Brabant, especially the western and northern parts, the first of the sandy regions of the Northern Netherlands where stall feeding came into use.

In the sixteenth century, thanks to spurry and stall feeding, farmers in Brabant were able to produce significant quantities of butter for market. In the late sixteenth century ever larger volumes of Brabant butter were brought to the Antwerp market. In many villages butter merchants bought the butter from the farmers and resold it in larger town markets.<sup>95</sup> Autumn butter, churned in October and November, was particularly sought after. It was considered one of the most important products of the region. And so, while farming in Brabant in the fifteenth century was primarily orientated towards grain cropping, it seems that the production of butter as a cash product gained in importance throughout the sixteenth and seventeenth centuries.<sup>96</sup>

#### 4. Conclusion

The 'long sixteenth century', and especially the decades after 1570/1580, witnessed a cascade of innovations in Dutch agriculture. The Dutch 'Golden Age' proved to be a hey-day for more than just trade, industry and the arts. Just as agriculture in the western and southwestern provinces benefited from the flourishing Flemish economy during the Late Middle Ages, so the economic boom in the Northern Netherlands after 1580 gave impetus to farmers and farming there. Conversely, other sectors of the economy were also able to benefit from a range of highly developed forms of agriculture. The keywords in this process are specialization and intensification, not only through a larger input of capital, but also through increasing input of labour. In the coastal provinces especially, farming developed standards which had no equal in Europe. In the various regions of the interior, farming in each region reacted to the

economic stimuli in its own way. This reaction depended on the position of the region in a Von Thünen field of force, of which the highly urbanized province of Holland unquestionably became the centre. Rather than speaking in terms of a dichotomy between coastal regions and the interior, it is preferable to emphasize an agri-economic continuum over the different farming regions.

## NOTES

\*.. This article is a shortened and somewhat adapted version of the first chapter of my book *Geschiedenis van de Nederlandse landbouw 1500-1950; Veranderingen en verscheidenheid* (Amsterdam/Meppel 1992).

1.. J. de Vries, *The Dutch rural economy in the Golden Age, 1500-1700* (New Haven/London 1974).

2.. In 1985, Noordegraaf was the first scholar to criticize De Vries's ideas on the process of specialization in the rural community in Holland between 1500 and 1650. L. Noordegraaf, 'Het platteland van Holland in de zestiende eeuw; Anachronismen, modelgebruik en traditionele bronnenkritiek', *Economisch- en Sociaal-Historisch Jaarboek* 48 (1985) 8-18. Also: ### Knotter, 'De Amsterdamse scheepvaart en het Noordhollandse platteland in de 16e en 17e eeuw; Het probleem van de arbeidsmarkt', *Holland* 16 (1984) 123-154; J.L. van Zanden, 'Op zoek naar de ?missing link?; Hypothesen over de opkomst van Holland in de late Middeleeuwen en de vroeg moderne tijd', *Tijdschrift voor sociale geschiedenis* 14 (1988) 359-386; J.L. van Zanden, *Arbeid tijdens het handelskapitalisme; Opkomst en neergang van de Hollandse economie, 1350-1850* (Bergen 1991) 41ff.

3.. Van Zanden, 'Op zoek naar de ?missing link?'; Van Zanden, *Arbeid*.

4.. H.K. Roessingh, *Inlandse tabak; Expansie en contractie van een handelsgewas in de 17e en 18e eeuw in Nederland* (AGG Bijdragen 20 (1976)/Zutphen 1976); H.K. Roessingh, 'Tobacco growing in Holland in the seventeenth and eighteenth centuries; A case study of the innovation spirit of Dutch peasants', *The Low Countries History Yearbook; Acta Historica Neerlandicae* 11 (1978) 18-54; H.K. Roessingh, 'Landbouw in de Noordelijke Nederlanden 1650-1815', *Algemene geschiedenis der Nederlanden* (Haarlem, 1979) VIII: 16-72; J. Bieleman, *Boeren op het Drentse zand 1600-1910; Een nieuwe visie op de 'oude' landbouw* (AGG Bijdragen 29 (1987)/Utrecht 1987); J. Bieleman, 'De verscheidenheid van de landbouw op de Nederlandse zandgronden tijdens ?de lange 16e eeuw?', *Bijdragen en Mededelingen betreffende de Geschiedenis der Nederlanden* 105 (1990) 537-552.

5.. W.P. Blockmans *et al.*, 'Tussen crisis en welvaart; Sociale veranderingen 1300-1500', *Algemene geschiedenis der Nederlanden* (Haarlem 1980) IV: 42-86. Bieleman, *Boeren*, 237ff.

6.. J.A. Faber *et al.*, 'Population changes and economic development in the Netherlands; A historical survey', *AAG Bijdragen* 12 (1965) 47-133.

7.. De Vries, *The Dutch rural economy*, 84ff.; A.M. van der Woude, 'Demografische ontwikkelingen van de Noordelijke Nederlanden 1500-1800', *Algemene geschiedenis der Nederlanden* (Haarlem 1980) V: 257ff.; A.M. van der Woude, 'La ville Néerlandaise', A. Lottin *et al.* (eds), *Études sur les villes en Europe occidentale; Milieu du XVIIe siècle à la veille de la Révolution française* (Paris 1983) 307ff.

8.. In fact, speaking in these broad terms, a third main geological area can distinguished, which is formed by the river clay area that joins the deltas of the Rhine and Meuse Rivers. However, hardly anything is known about the agricultural history of this region.

9.. The German economist Johann Heinrich von Thünen, in his study *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie* (first published in 1826), argued that the cost of transporting agricultural products to market was the major determinant of the intensiveness of farming systems. His 'isolated state' was a plain with no differences in soil or climate, within a radius of 370 km from a central town, where all produce was sold. Beyond this was a wilderness. Towards this central town intensiveness of agricultural systems increased with distance from the town, according to a concentric model. In 1959 the German scholar Achilles demonstrated the existence of a Von Thünen-like zoning over Europe in cereal prices, of which Amsterdam formed the ultimate focus. W. Achilles, 'Getreidepreise und Getreidehandelsbeziehungen europäischer Räume im 16. und 17. Jahrhundert', *Zeitschrift für Agrargeschichte und Agrarsoziologie* 7 (1959) 32-55. After Achilles, Abel pointed out that as early as the 16th century in northwestern Europe, zoning in agriculture appeared that is in great conformity with Von Thünen's model of the 'isolated state'. W. Abel, *Agrarkrisen und Agrarkonjunktur; Eine Geschichte der Land- und Ernährungswirtschaft Mitteleuropas seit dem hohen Mittelalter* (Hamburg/Berlin 1978<sup>3</sup>) 112-114. See also: H.-J. Nitz, 'Transformation of old and formation of new structures in the rural landscape of northern Central Europe during the 16th to the 18th centuries under the impact of the early modern commercial economy', *Tijdschrift van de Belgische Vereniging Aardrijkskundige Studies BEVAS* 58 (1989) 267-290; J. Myrdal & J. Söderberg, *Kontinuitetens dynamik: agrar ekonomi i 1500-talets Sverige* (Stockholm 1991); B.M. Campbell *et al.*, 'Rural land-use in the metropolitan hinterland, 1270-1339; The evidence of inquisitions post mortem', *The Agricultural History Review* 40 (1992) 1-22.

10.. Ester Boserup's book *The conditions of agricultural growth; The economics of agrarian change under population pressure*, published in 1965, brought about a fundamental change in the thinking of historians about the classic Malthusian field of tension between demographic changes and agricultural production. The major cause of changes in agriculture, she argues, is increasing population density.

11.. J.J.J.M. Beenakker, 'De agrarische veenlandschappen', S. Barends *et al.* (eds), *Het Nederlandse landschap; Een historisch-geografische benadering* (Utrecht 1986) 39ff.

12.. Van Zanden, 'Op zoek naar de ?missing link?'; Van Zanden, *Arbeid*, 41ff.

13.. J.A. Faber, 'Het probleem van de dalende graanaanvoer uit de Oostzeelanden in de tweede helft van de zeventiende eeuw', *AAG Bijdragen* 9 (1963) 3-28.

14.. According to Slicher van Bath, in the sixteenth century this amount was enough to feed 13 to 16% of the Dutch population. B.H. Slicher van Bath, *De agrarische geschiedenis van West-Europa 50-1850* (Utrecht 1960<sup>1</sup>-1987<sup>6</sup>) 264 and 405 note 136. Jan de Vries reckons that in about the middle of the seventeenth century, imported quantities of grain were enough to supply half of the population of Holland, Utrecht, Friesland and Groningen. De Vries, *The Dutch rural economy*, 172.

15.. J.A. Faber, *Drie eeuwen Friesland; Economische en sociale vernieuwingen van 1500 tot 1800* (AAG Bijdragen 17 (1972)/Leeuwarden 1972) 191ff.

16.. T.J. de Boer, 'De Friesche kleiboer', *Tweemaandelijks Tijdschrift voor Letteren, Kunst, Wetenschap en Politiek* 4 (1897/98) 235.

17.. P.C.M. Hoppenbrouwers, 'Grondgebruik en agrarische bedrijfsstructuur in het Oldambt na de vroegste inpolderingen (1630 - ca. 1720)', J.N.H. Elerie & P.C.M. Hoppenbrouwers (eds), *Het Oldambt II: Nieuwe visies op geschiedenis en actuele problemen* [= *Historia Agriculturae* 22 (1991)] 89. [Is dit de bedoeling???

18.. B.H. Slicher van Bath, 'Een Fries landbouwbedrijf in de tweede helft van de 16e eeuw', *Agronomisch-Historische Bijdragen* 4 (1958) 99; Slicher van Bath, *De agrarische geschiedenis*, 198ff. and 268ff.; W. Bergsma & E.H. Waterbol, *Kroniekje van een Ommelander boer in de zestiende eeuw* (Groningen 1986) 35-36.

19.. De Vries, *The Dutch rural economy*, 137-140 tabel 4.10.

20.. De Vries, *The Dutch rural economy*, 137-140 tabel 4.10.

- 21.. De Vries, *The Dutch rural economy*, 148 table 4.11.
- 22.. Slicher van Bath, 'Een Fries landbouwbedrijf', 97-98.
- 23.. De Vries, *The Dutch rural economy*, 148 table 4.11. The growing demand for coleseed and other oleiferous crops can be demonstrated by the increase of oilmills in the Zaanstreek. In the early seventeenth century there were just a few, but about 1650 there must have been at least 140 of them in this 'industrial centre', and in the whole of Holland about 200. A.M. van der Woude, *Het Noorderkwartier; Een regionaal historisch onderzoek in de demografische en economische geschiedenis van westelijk Nederland van de late middeleeuwen tot het begin van de negentiende eeuw* (AAG Bijdragen 16 (1972)/Utrecht 1972) 495-501.
- 24.. Slicher van Bath, 'Een Fries landbouwbedrijf', 89 and 159.
- 25.. Bergsma & Waterbolk, *Kroniekje*, 35-36.
- 26.. De Boer, 'De Friesche kleiboer', 406.
- 27.. J.A. Faber, 'Bildtboer met ploeg en pen', P. Gerbenzon (ed.), *Het aantekeningenboek van Dirck Jansz. Estrikken 31* (Grins/Groningen 1960) XXII-XXVIII; De Vries, *The Dutch rural economy*, 165.
- 28.. M.J. Boerendonk, *Historische studie over den Zeeuwschen Landbouw* ('s-Gravenhage 1935) 65ff.; P.J. Bouman, *Geschiedenis van den Zeeuwschen landbouw in de negentiende en twintigste eeuw en van de Zeeuwsche Landbouw-Maatschappij 1843-1943* (Wageningen 1946) 23ff.; W.J. Dewez, 'De landbouw in Brabants Westhoek in het midden van de achttiende eeuw', *Agronomisch-Historische Bijdragen* 4 (1958) 1-65; C. Baars, *De geschiedenis van de landbouw in de Beijerlanden* (Wageningen 1973) 129ff.
- 29.. Boerendonk, *Historische studie*, 140.
- 30.. Boerendonk, *Historische studie*, 90ff.; C. Wiskerke, 'De geschiedenis van het meekrapbedrijf in Nederland', *Economisch-Historisch Jaarboek* 25 (1952) ###; J.M.G. van der Poel, 'De teelt van meekrap', *Ceres en Clio; Zeven variaties op het thema landbouwgeschiedenis* (Wageningen 1964) 129-166.
- 31.. A. Verhulst, *Precis d'histoire rurale de la Belgique* (Bruxelles 1990) 119.
- 32.. L. Guicciardini, *Beschryvinghe van alle de Neder-landen (overgheset in de nederduytsche spraecke door Cornelium Kilianum; Met verscheyden historien ende aenmerckingen vermeerdert ende verciert door Petrum Montarum)* (Amsterdam 1612; reprint 1968) 166.
- 33.. Wiskerke, 'De geschiedenis van het meekrapbedrijf', 65ff.; J.W. Schot, 'Het meekrapbedrijf in Nederland in de negentiende eeuw nader bezien in het licht van het industrialisatie-debat', *Economisch en Sociaal-Historisch Jaarboek* 50 (1987) 101.
- 34.. De Vries, *The Dutch rural economy*, 137-140 table 4.10.
- 35.. Van der Woude, *Het Noorderkwartier*, 575-576.
- 36.. C.M. Lesger, *Hoor als stedelijk knooppunt; Stedensystemen tijdens de late middeleeuwen en vroegmoderne tijd* (Hilversum 1990; Hollandse Studiën 26) 35.
- 37.. P.N. Boekel, *De zuivelexport van Nederland tot 1813* (Utrecht 1929) 41-46 and 82.
- 38.. Boekel, *De zuivelexport*, 54.
- 39.. Boekel, *De zuivelexport*, 56-58.
- 40.. S. de Jong, *17de eeuwse landelijke bouwkunde in Amstelland; Een analyse van een aantal bouwbestekken, afrekeningen en contracten van agrarische gebouwen* (Arnhem 1988).
- 41.. Van der Woude, *Het Noorderkwartier*, 568 and 700 note 11.
- 42.. De Vries, *The Dutch rural economy*, 185-186. See also: J. de Vries, 'Peasant demand patterns and economic development; Friesland 1550-1750', N. Parker & E.L. Jones (eds), *European peasants and their markets; Essays in agrarian economic history* (Princeton, 1975) 215.
- 43.. Guicciardini, *Beschryvinghe*, 224.
- 44.. De Vries, *The Dutch rural economy*, 144. In the first half of the nineteenth century the milk yield of normal, good quality milking cows in the Dutch dairy district was as high as 2,700 to 3,000 litres per year. J.M.G. van der Poel, 'Landbouw in de Noordelijke Nederlanden', *Algemene geschiedenis der Nederlanden* (Haarlem 1981) X: 180-182; J.M.G. van der Poel, 'Het Noordhollandse weidebedrijf in de 19e eeuw', *Holland; Regionaal Historisch Tijdschrift* 8 (1986) 154-155.
- 45.. J.M.G. van der Poel, *Honderd jaar landbouwmechanisatie in Nederland* (Wageningen 1967) 62.
- 46.. M.J. Boerendonk, 'Economische aardrijkskunde van Holland omstreeks het jaar 1500', *Tijdschrift voor economische geographie* 30 (1939) 132.
- 47.. H. van der Wee, 'Introduction ? The agricultural development of the Low Countries as revealed by the tithe and rent statistics, 1250-1800', H. van der Wee & E. van Cauwenbergh (eds), *Productivity of land and agricultural innovation in the Low Countries (1250-1800)* (Leuven 1978); H. van der Wee & E. Aerts, 'The Lier livestock market and the livestock trade in the Low Countries from the 14th to the 18th century', E. Westermann (ed.), *Internationaler Ochsenhandel (1350-1750); Akten des 7th International Economic History Congress Edinburgh 1978* (Stuttgart 1979).
- 48.. M. Fokkens, *Beschrijvinge der wijdt-vermaarde koopstadt Amstelredam* (Amsterdam 1662<sup>2</sup>) 52. The information on the number of VOC vessels leaving Amsterdam each year for the East Indies may stem from an earlier first edition of Fokkens' book. Around the 1660s the number of ships can be expected to have been about a dozen.
- 49.. I. Blanchard, 'The continental European cattle trades, 1400-1600', *Economic History Review* 39 (1986) 427-460.
- 50.. H. Wiese, 'Der Rinderhandel im nordwesteuropäischen Küstengebiet vom 15. Jahrhundert bis zum Beginn des 19. Jahrhunderts', H. Wiese & J. Böltz, *Rinderhandel und Rinderhaltung im nordwesteuropäischen Küstengebiet vom 15. bis zum 19. Jahrhundert* (Stuttgart 1966) 92ff.
- 51.. Wiese, 'Der Rinderhandel', 71-72.
- 52.. Van der Woude, *Het Noorderkwartier*, 570-571.
- 53.. Boerendonk, 'Economische aardrijkskunde', 130-132.
- 54.. Drs. H. Hoogendoorn of the Department of Rural History of the Agricultural University of Wageningen is preparing a thesis on this subject. I am greatly indebted to him for some personal communications.
- 55.. P. Verhagen, *De hennepeteelt* (Hardinxveld/Giessendam 1986) 29.
- 56.. Guicciardini, *Beschryvinghe*, 224.
- 57.. W.J. Sangers, *De ontwikkeling van de Nederlandse tuinbouw (tot het jaar 1930)* (Zwolle 1952) 31; W.J. Sangers, *Gegevens betreffende de ontwikkeling van de Nederlandse tuinbouw*

(tot het jaar 1800) (Zwolle 1953) 33; De Vries, *The Dutch rural economy*, 257-258.

58.. L. Noordegraaf, 'Nijverheid in de Noordelijke Nederlanden 1580-1650', *Algemene geschiedenis der Nederlanden* (Haarlem 1980) VII: 77.

59.. S. Blankaart, *Den Neder-landschen herbarius ofte kruidboek der voornaamste kruiden, tot de medicynne, spys-bereidingen en konstwerken dienstig; handelende van zommige hier te lande wassende boomen, kruiden, heesters, mossen, enz.* (Amsterdam 1698) 372-373.

60.. This passage and the following ones on horticulture are based on: Sangers, *De ontwikkeling*. Also: De Vries, *The Dutch rural economy*, 153-155.

61.. De Vries, *The Dutch rural economy*, 154.

62.. De Vries, *The Dutch rural economy*, 154.

63.. Faber, *Drie eeuwen Friesland*, 178.

64.. E.H. Krelage, *Drie eeuwen bloembollenexport; De geschiedenis van den bloembollenhandel en der Hollandsche bloembollen tot 1938* (Den Haag 1946) 7, 451ff. and 473ff.

65.. J. Kuys & J.T. Schoenmakers, *Landpachten in Holland, 1500-1650* (Amsterdam 1981; Amsterdamse Historische Reeks 1).

66.. H. de Bakker & G. Staal, 'Natuur en techniek in bodem en landschap van Nederland', *Natuur en techniek* 46 (1978).

67.. J.J. Voskuil, *Van vlechtwerk tot baksteen; Geschiedenis van de wanden van het boerenhuis in Nederland* (Arnhem 1979).

68.. De Vries, 'Peasant demand patterns', 216-217.

69.. R.C. Hekker, 'De ontwikkeling van de boerderijvormen in Nederland', S.J. Fockema Andreae *et al.* (eds), *Duizend jaar bouwen in Nederland* (Amsterdam 1957) II: 220ff.; R.C. Hekker, 'Historische boerderijtypen', *Atlas van Nederland* ('s-Gravenhage 1973) blad X-1.

70.. Bieleman, 'De verscheidenheid', 1990.

71.. The following passages on agricultural developments in the province of Drenthe are all based on: Bieleman, *Boeren*.

72.. As a comparison: in 1807 the average number of cattle kept by 'farmers' was about eleven. The average kept by all keepers of cattle was six. Bieleman, *Boeren*, 343.

73.. B.H. Slicher van Bath, 'De oogstopbrengrsten van verschillende gewassen, voornamelijk granen, in verhouding tot het zaaizaad, ca. 810-1820', *AAG Bijdragen* 9 (1963) 109; B.H. Slicher van Bath, 'Yield ratios, 810-1820', *AAG Bijdragen* 10 (1963) 81-85.

74.. J. Bieleman, 'De Noord-Drentse hopteelt', *Nieuwe Drentse Volksalmanak* 98 (1981) 61-78.

75.. H.K. Roessingh, 'De veetelling van 1526 in het kwartier van Veluwe', *AAG Bijdragen* 22 (1979) 3-57.

76.. B.H. Slicher van Bath, *Een samenleving onder spanning; Geschiedenis van het platteland van Overijssel* (Assen 1957) 527-537.

77.. Roessingh, 'De veetelling van 1526'.

78.. A. Verhulst, 'De inlandse wol in de textielnijverheid van de Nederlanden van de 12e tot de 17e eeuw; Productie, handel en verwerking', *Bijdragen en Mededelingen betreffende de Geschiedenis der Nederlanden* 85 (1970) 6-18.

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81.. H.K. Roessingh, *De visitatie van de graanvoorraad in 1566 (de Veluwe)* (Department of Rural History, Agricultural University Wageningen; unpublished manuscript).

82.. Roessingh, *Inlandse tabak*; H.K. Roessingh, 'Tobacco growing in Holland in the seventeenth and eighteenth centuries; A case study of the innovation spirit of Dutch peasants', *The Low Countries History Yearbook; Acta Historica Neerlandicae* 11 (1978) 18-54.

83.. H.K. Roessingh, 'Het Veluwe inwonertal 1526-1947', *AAG Bijdragen* 11 (1964) 118-120.

84.. J. Schepers & E. Jans, 'Balken und Deelen; Alte ländliche Baukunst', B.H. Slicher van Bath *et al.* (eds), *Geschiedenis van Overijssel* (Deventer 1970), 329.

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86.. Thoen, *Landbouweconomie*, 845ff.

87.. Thoen, *Landbouweconomie*, 997-1000.

88.. Thoen, *Landbouweconomie*, 725-733; C. Vandenbroeke, 'Landbouw in de Zuidelijke Nederlanden 1650-1815', *Algemene geschiedenis der Nederlanden* (Haarlem 1979) VIII: 78-80; ### Van Isterdael, 'Landbouwstructuren in het Land van Aalst (17de - 18de eeuw)', *Het Land van Aalst; Tijdschrift van de Geschiedkundige Vereniging Het Land van Aalst* 40 (1988) 269-308.

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96.. Lindemans, *Geschiedenis van de landbouw*, I: 427.