Summary

In this summary, references are made to graphs, tables and maps in the main text.

Early sixteenth century clay soil agriculture in Friesland had characteristics which, in retrospect, seem quite modern.[621] In 1511, rental value of agricultural land was surveyed. According to this survey, the area – except for its utter south-west corner - was characterized by rather large farms, at least when compared with Holland. In the south-west, most families were occupied with fishing or sailing and agriculture was small-scale and aimed at subsistence. Probably, most agricultural work here was carried out by women and elderly men. The other part of the clay soil area farm size was typically about 15 to 20 hectares. Larger and smaller farms were not uncommon, larger ones often on monastic lands. A large part of Friesland – the so called 'greidhoek', 'greide' meaning pastures – would in later times almost exclusively be used as grassland. Grasslands and dairy and cattle farming dominated this area already in 1511, though there was still some arable land left.[622] Around 1560, in the county of Hennaarderadeel in this greidhoek, many farmers still owned ploughs but stocks of cattle were considerable, while all farmers owned utensils for making butter as well as for making cheese.[623] They also universally owned specialized labour saving equipment used for harvesting hay. Directly along the coast, arable farming was more important and more large as well as small farms existed. Though average farm size was comparatively large, real 'latifundia' did not exist. The largest average farm size may have been found in the Bildt area, which was poldered in 1511 and afterwards divided into rather large farms. But even there, a farm size of more than several dozen of hectares was exceptional.

This structure of quite large and rather specialized farms would turn out to be fit for future developments. Of course there were some changes over time, but apart from the south-west corner farm sizes would not change too much in the course of the centuries. In the south west corner, the economic crisis at the end of the seventeenth and the beginning of the eighteenth century would lead to the disappearance of the multitude of smallholdings and the appearance of farms

[621] Map 4.1. Friesland is situated in the south-western corner of the map. Along the coast of Friesland, there is a clay soil area of about 10 to 30 kilometers wide. Apart from this clay soil area Friesland also has extensive sand soil and lowland peat soil areas. In the text, 'Friesland' is often (but not always!) shorthand for 'the clay soil area of Friesland'. Map 0.1 shows present day boundaries of Friesland.

[622] Map 5.1 shows land use around 1825. Around 1511, a much larger part of the area was characterized as yellow hayfields, while especially the northern part of the greidhoek had more arable land. The southern part was already around 1511 largely devoted to the main crop of the Netherlands: grass.

[623] Map 0.1 shows the counties.

of about the same size as the rest of the clay soil area. In the rest of the area, up to 1550 the largest farms would slightly decrease in size while the number of smallholdings increased. In the long run the number of large farms would, however, increase, at the cost of average sized farms. Only after about 1760 the spread of potato culture in combination with population growth and a favourable development of agricultural prices would, in some areas, lead to the rise of a new class of small farmers. Small scale agriculture was also characteristic for areas around the multitude of middle sized and small cities in Friesland. Around the capital, Leeuwarden, commercial horticulture took on hold from the end of the sixteenth century on, while grasslands around the cities were rented by the burghers of these cities to be used for subsistence production of milk and meat. As the poor could not afford to pay land tax and rents, they could not participate in this kind of agriculture.

The remarkable stability in land use was mirrored by a remarkable stability of the size of the rural population. Though the population of the cities increased considerably between 1500 and 1650, just like in Holland, Zeeland and Groningen, the population of the countryside increased rather little up to 1750. Up to about1660 there was some growth. After 1660, a decline which probably lasted till 1740 can be witnessed. Compared with the increase of the rural population of Holland up to 1660 and the dramatic decline of the population of the Noorderkwartier of Holland after 1660 these developments were, however, quite modest.[624] In Friesland, the population increase of the arable area was, up to 1660, more than the population increase of the pasture areas, while the post 1660 decline was larger in the pasture area than in the arable area. Only the south west corner, including its many but small coastal cities and villages, saw a population decline comparable to developments in rural Holland. This decline was paralleled by the decrease of the number of smallholdings. After 1750, the population started to increase in all areas, though growth in the pasture area clearly lagged behind comnpared to the arable area. Compared with developments in previous centuries the increase of the population of the arable area was considerable. In half a century, population increased with 50% and in 1830 population density would be twice as high as in 1511. The population of the pasture area, which in 1511 had the same population density as the arable area, increased up to 1830, compared with 1511, with only 33%. Around 1750, population density in this district was hardly higher than in 1511 (admittedly, the 1511 data are far from precise)!

The different rates of increase of the population are symptomatic for different paths of agricultural development. Arable agriculture was intensified: an increased use of labour per hectare for activities like weeding and, after 1760, po-

[624] Table 9.9

tato production. In the pasture areas growth must have been caused largely by technological change. Examples are the use of small windmills for drainage purposes, a more intensive use of manure on better drained lands and the use of the labour saving churning mill, driven by horsepower. After about 1600, much work was also carried out by migratory labour, especially during the hay harvest. Specialization may have played a role. For the pasture area, one can think of turning the remaining bits of arable land into pasture. In times of crisis, farmers also turned to labour extensive production of hay or cattle instead of labour intensive production of butter and cheese. Remarkably, the rental value of good pasture was, in 1511 as well as at the time of the cadastral survey of the 1820's, about as high as the rental value of good arable land. For 'good' one can, in the case of Friesland, read 'well drained and preferably rich in calcium'.

Not only the size of farms and the relatively high degree of specialization were rather modern at the beginning of our period. The input as well as the output side of agriculture was highly market oriented. Outputs like wheat, barley, oats, fat oxen, cows, cheese, butter, horses and reed were sold on ´the market´. Inputs like land, labour, cows, horses as well as the services of the blacksmith, tailors, weavers and wagon makers were also rented or obtained on ´the market´. The institutional structure of the market of course influences the amounts and the prices of traded goods and services. In 1511, there was a clear market for renting land. A large part of total territory was rented and in 1511 as well as during the rest of the sixteenth century rack rents paid in money seem to have been the norm.[625] In theory, only lands designated for use by local clergy like the village priest were not available on this market, but in fact even these lands were often and increasingly leased out by these priests. The same was true for the extensive amount of monastic land.[626] Rents of monastic lands were, in the beginning of the sixteenth century contrary to most other rents often in kind, but after the seizure of these lands by the government in 1580, these rents were also monetized. Sixteenth century inflation led to an increase of nominal Ricardian land rent. Ricardian rent was often divided among different stakeholders, like the church, several owners, lenders and the like. Struggles between these stakeholders (and, of course, the farmers) about the division of the increase led to the definition of a new legal right, called 'bruikma'. This right stipulated which of the stakeholders had the right to increase his or her share of the Ricardian rent. Stimulated by the increasing use of Roman law and written documents by the courts, this right fell to the owner of the lands, which meant that

[625] Significantly, rack rents are in Dutch called 'rents'. They were the rule, not the exception. In this text, 'rent' is used in the sense of 'rack rents'.
[626] The late mediaeval properties of the Frisian cloisters van be found on www.hisgis.nl

the market for the use of land got a more precise juridical basis.[627] In the long term, the government also succeeded in increasing its share by increasing the land tax. Sometimes, farmers rented parcels of land, but more often entire farmsteads were rented.

The distinction between owners and users of land can be useful from the analytical point of view. On the individual level, however, differences were less clear. Many farmers rented their farms but also owned land somewhere else (often in combination with other people) which they rented out. Also, part of the grasslands was used for grazing (the 'fennen') and part for making hay (the 'mieden'). Especially the mieden were in the sixteenth century often used as a kind of undivided communal ownership.[628] In the seventeenth and eighteenth century, a large part of these hayfields were divided between the owners. The cadastral survey in the twenties of the nineteenth century shows that in 1820 at the latest agricultural improvements – better drainage, better manuring, an earlier start of the hay harvest – had led to the disappearance of the, in 1511, universal distinction between fennen and mieden, the most remarkable developments of pasture farming in these centuries.[629] Only on peat soils, real hayfields still could be found. Reed culture, which around 1540 still was of some importance, also vanished to lesser grounds.

Especially for the earlier centuries, little is known about the agricultural labour market. At the beginning of the sixteenth century, paid labour was used for the hay harvest. It also seems probably that, around 1560 and, very probably, earlier, at least the larger farms had servants living in. But especially the use of day labourers seems to have been smaller than later on. Around 1600, increasing numbers of migratory labourers from the eastern parts of the Netherlands and the adjacent parts of the German lands came to the coastal zone of the Netherlands and also to Friesland. This may have been connected to an increased production of the better drained land and an increased use of manure to fertilize pastures. The increased use of migratory labour may partly explain the rather limited increase of the population of the pasture district. Horses were also bought and sold on a regular basis. In Hennaarderadeel, part of the pasture district, farmers bought horses in early summer which were used during the hay harvest and the rest of the summer. These horses were sold again on the October horse market. Land, labour and even animals were, in the sixteenth century, obtained on the market.

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[627] The farmers of the new Bildt area, who all had the same landlord, around 1520 as well as around 1610 tried to obtain hereditary leaseholds instead of rack rents. In both cases, force was used to make them comply with rack rents, though the courts did grant them a score of other rights.

[628] Ownership was individual and could be bought and sold, just like present day shares. Somebody had, for instance, 1/16th of the ownership of a certain parcel of hayfields.

[629] Map 5.1

For the latter part of the sixteenth century it can be proven that at least part of the farms sold as large a part of their production on the market as nineteenth century farms. Despite this, rather little is known about prices or amounts of traded goods during the sixteenth century. For 1524–1532, information is available for the weighing house of Leeuwarden, were marketed butter was weighed and controlled. This was an important period. Between 1498 and 1525, Friesland knew quite some violence from the wars connected with the establishment of centralized power and marauding soldiers as well as floods and outbreaks of the plague as well as, probably, cattle plague. After 1525, circumstances were more peaceful and less disastrous. The consequences are shown by the amount of marketed butter in Leeuwarden. Between 1525 and 1532, this almost doubled! Some rough calculations suggest that this must have been the larger part of all butter produced by a rather specialized agriculture in a circle with a radius of about 14 kilometer around Leeuwarden. This underscores the importance of markets to agriculture in Friesland during the first part of the sixteenth century. Rent of the 5.000 hectare Bildt area also doubled in 1525 and showed further increase later on. After 1525, a period of prosperity indeed seems to have set in, though at first violence was needed to collect the Bildt rents. It is possible that, as the state increasingly monopolized the right to use violence during the sixteenth century, in the long run the economic motive started to play a larger role in the life of farmers. Instead of building 'stinzen', a kind of rather small brick boroughs aimed at protecting the household from small scale violence connected with the feuds characterizing Friesland before the 1498–1525 period, farmers started to invest in brick houses and cool brick dairy cellars, drainage mills and the like. But the sudden increase in prosperity after 1525 must be rated as a peace dividend.

Though the structure of agriculture as well as the importance of markets for inputs and outputs was rather modern, other aspects of sixteenth century Friesland were clearly less modern around 1511. Technologically, Friesland seems to have lagged behind Holland and Zeeland. The building of more complex sluices required assistance from experts from Holland and Zeeland. Windmills for grinding corn were known in Friesland, but only became more numerous during the second part of the sixteenth century. The dykes of the new Bildt area, which were built with the help of experts as well as labour from Holland, were higher and better than traditional dykes in Friesland. As a result, the Bildt area knew, up to 1570, far fewer floods than other parts of Friesland. This would change only after 1570. None of these technologies were directly connected to agriculture, but all of them must have had a positive influence upon production and productivity of agriculture. An important change directly connected to agriculture was the introduction of windmills for drainage purposes. The first known

instance of its use in Friesland is from 1551.[630] They were probably used already somewhat earlier. But available data do suggest that it was the second halve of the sixteenth century which saw its spread. Drainage mills made it possible to extend the growing season, as grass on drained grasslands started to grow earlier. Normally, a large part of the Frisian lands were flooded during winter. This would stay the case till the end of our period (and long after). Windmills shortened the flooded period. Also, more lands must have stayed dry for most of the year. It had little use to fertilize lands which were flooded for long periods. The amount as well as the quality of hay from such land was much less than that of hay from well drained, well fertilized lands. Monetary proceeds from the hay harvest of good pastures were, around 1800, about twice as high as proceeds from pastures which were flooded during the winter months.[631] To improve productivity of grasslands, more was needed than just drainage. Increased harvests require increased fertilization. Around 1550, pasture farms used manure to make 'dompen', a kind of fuel which was used for heating, cooking and dairy production. In summer, manure was even gathered from the fennen to make these dompen. Using drainage mills to improve grasslands made use of manure to fertilize these fields more effective. Probate inventories show that after the middle of the century, pasture farmers slowly started to buy increasing amounts of turf from the peat areas of Friesland. Eventually, pasture farmers (or, probably, in fact their wives, daughters and servants) would not only stop gathering manure in summer but even start to use manure from the winter period to fertilize their lands. It is not impossible that the increased amount and quality of the hay resulting from improved drainage and fertilization led to the building of larger barns which made it possible to stock the hay harvest inside instead of outside. The increase of the harvest made it also necessary to use more labour during the hay harvest, which must have stimulated the inflow of migratory labour. Around 1550, arable farmers already used their manure to fertilize their arable lands and changes in production and productivity must have been less large. Almost certainly, the yield of milk cows increased quite considerably. But at the moment it is not possible to track this with any kind of precision. Summarizing: pasture farming changed considerably from about the middle of the sixteenth century. Grasslands became more productive, farms were improved and enlarged and more labour was used. This must have resulted in more milk and dairy. To put it upside down: compared with the situation of the beginning of the seventeenth century, especially pasture farming at the beginning of the sixteenth century was relatively primitive.

In a political sense, Friesland anno 1511 was also far from modern. In 1498, the first attempts to establish a centralized state were made. With the introduc-

[630] Table 9.13
[631] Table 5.1.

tion of the ´floreenbelasting´, the land tax based upon the survey of the rental value of lands of 1511, this embryonic state did manage to obtain a fairly solid tax base. The final pacification of Friesland would, however, have to wait till 1525. Until 1498, Friesland was a clear example of a feud based society. In a feud bases society, violence is not monopolized by the state. Rule bound violence was a means with which individuals could and had to obtain justice. The feuds characteristic for such societies also forced people to reckon on violence and to invest in expensive armour as well as, in the case of 'hoofdelingen' (more or less: clan leaders), in stinzen. In the long run, this violence-function of the household would shift to the regular army of the state and wither away.

Though the central state clearly increased its power and scope in sixteenth century Friesland this did not mean that the central institutions were effective. After the All Saints Flood of 1570 –

the most severe flood of the sixteenth century – the Frisian state did not manage to repair the extensive damage to the dykes. Radical measures of Caspar de Robles, head of the Spanish forces in Friesland, broke the stalemate (by hanging several people who, claiming chartered freedoms, did not want to pay) and new dykes were built – higher, wider and safer than before. This was probably the single most importance improvement to agriculture in our entire period. Though problems with water management were there to stay and though part of these problems were caused by ineffective government action, the measures taken did cause a marked decrease in the number of floods. Contemporaries were keenly aware of this, which led to the rather unique situation that the radicals of the Dutch Revolt, who ousted Caspar de Robles as a foreign oppressor, also erected a statue for him.[632] After the large flood of 1717 it turned out that the political system had evolved. Radical reforms of dyke maintenance could also be ordained by the regular political process. This had been made easier by the monetizing and de-individualizing of dyke maintenance obligations in the course of the sixteenth, seventeenth and eighteenth century.[633] People had to pay dyke-taxes, instead of delivering services in kind. But even after the floods of 1698 and 1717, the central government still put pressure on several local communities to change to change systems of individual dyke maintenance duties into communal arrangements.[634] Another important change for Frisian agriculture was the increase of the scale of the markets. Cities in Friesland and, especially, Holland increased in size and the technique as well as the organization of transport improved. A system of regular transport services between many cities and villages (the so called 'beurtveren') was established. The free internal market of the

[632] The 'stenen man' (man of stone), still standing near Harlingen.
[633] This, among other things, made it possible for the dyke maintenance bodies to run a temporary deficit in case of an emergency which could be paid off later.
[634] *Register der resolutien I,* 187-188.

Dutch Republic has caused a lack of duty data on transport of goods within the Republic, which means that we are much better informed on the exports of grains from far away Danzig to Amsterdam than on the exports of butter, grain, cheese and animals from Harlingen to nearby Holland. But this free market must have stimulated exports of Frisian products to the growing markets of Holland. It is not impossible that the asymmetry in data has led historians to underestimate exports of Friesland (and Groningen) to Holland compared with exports from the Baltic and the 'small east', the area between the Republic and Denmark.

Anno 1500, Frisian agriculture was characterized by modern aspects - farm size, specialization, the importance of markets. Technology – including water management and dyke building – was still quite backward, compared with later centuries. The first decades of the sixteenth century were characterized by war, floods, plague and cattle plague, which together disrupted Frisian society. After 1525, prosperity of Frisian agriculture seems to have improved quite dramatically. The flood of 1570 in combination with the violence of the Dutch Revolt caused a backlash in the 1570's. But the investment process which is visible in agriculture from the 1550's on continued after 1580.

Quite some information is available on the size of farms and on land use at the beginning of the sixteenth century, but less in known about farming itself. De Vries sketches the broad outlines of agricultural development between 1500 and 1650 in the coastal zone of the Netherlands as follows: 'A farm of 15 to 20 hectares – when around 1500 was not large enough to put all labour of the family to productive use – could, if it was situated on well-drained lands, around 1650 employ all family members plus one or two servants/maids and some seasonal workers. The multitude of side jobs which around 1500 had played an important role in the existence of the farm household were by now carried out by specialized traders, craftsmen and day labourers." [635] This specialisation was, according to De Vries, the basis for a large increase of production as well as productivity. Though our understanding of Frisian agriculture around 1500 still is quite vague, it does require some changes of this vision. First, early sixteenth century agriculture might have required more labour than suggested by De Vries. Agriculture along the coast required a considerable minimum of effort regarding water management: digging and cleaning ditches, maintaining large and small bridges, large and small sluices and other often small scale infrastructure. The season forced farmers to spells of intensive work during the hay and the grain harvest. At 1570 at the latest, there were extensive systems of division of labour during the hay harvest. Remarkably, the probate inventories of around 1560 universally indicate the presence of labour saving equipment for the hay harvest. This points to labour shortages during the hay harvest as well as to an

[635] De Vries en van der Woude, *Nederland 1500–1815,* 253–254.

extensive use of seasonal labour. In the county of Hennaarderadeel, one of the probate inventories possibly mentions a 'dorsrol', a large conical wooden role used for threshing which supposedly only came into use after about 1700. Also, quite some middle sized and large farms were headed by widows, which suggests the presence of a labour market. For later periods it can at least be proved that when a farmer died a new living in servant was hired. Possibly, this also was the case in the sixteenth century. Some of the sixteenth century probate inventories contain wage debts which suggest that larger farms had more living in servants. This does not suggest that there was slack labour on the farms. Accounts from sixteenth century monasteries also mention payments to day labourers (especially during the hay and grain harvest) as well as to living in farm servants. The probate inventories show that farmers made butter as well as cheese, a notoriously labour intensive combination. Clay soil cattle was more expensive than cattle from the sandy soils and must, therefore, have been larger and more productive. Gathering manure and turning it into fuel took time. Sometimes, small stretches of relatively high and fertile land alongside the ditches were used for an intensive kind of arable production. Summarizing: already at the beginning of the sixteenth century, Frisian agriculture was quite intensive.

Also, quite some of the side activities mentioned by De Vries, like fishing, catching birds, gathering reed and gathering fuel, really were no side activities at all. Around 1500, fishermen were often specialized craftsmen, fishing for different kinds of fishes, crabs or oysters. Catching birds required large investments in the establishment and maintenance of decoys[636]. At the beginning of the sixteenth century, monasteries used paid labour to manage these decoys! There was a lively trade in reed, which was not 'gathered', but tilled and harvested on special parcels which had a defined rental value. As the reed harvest took place towards the end of winter, reed culture did fit quite well into the seasonal pattern of agricultural work. These activities required investments, on the job training or were intertwined with agricultural practice and, therefore, no side activities but farm work. The complexity of farm production has to be stressed. Recent research has shown that even on the clay soils, the production of wood – trees around farms and along roads, but also on special parcels like decoys – was not without importance. After 1600, this wood must have been used as firewood and for wooden constructions. Before 1600 the use of willow branches for the construction of walls of old style farm houses must have been considerable and there are signs of a market for these twigs.[637] During our whole period, agriculture

[636] 'Decoy' comes from Dutch 'eendekooi', or 'cage for ducks', 'eend' meaning duck. 'Eendekooi was understood by the english as 'een dekooi' (a 'cage') and 'dekooi changed into 'decoy'.

[637] In Friesland, no examples of this kind of construction of walls are known anymore, though reed is often still used on roofs. The last remnants of such walls probably vanished long ago. In the Ardennen in Belgium, this style of building walls can still be witnessed in older buildings.

produced a whole array of products. The combination of these different branches of production did cost a lot of time. For livestock farming, one can think of fat and meager cattle, hides, butter, cheese, whey, milk, fowl, honey, buttermilk, horses, meat and manure. For arable farming, one can think of wheat, barley, oats, beans, peas, rape seed or flax. The production of vegetables, root crops and fruit on the 'hiem' around the farm should also not be underrated. The combination of all these activities resulted in a complex pattern of production.

Patterns of ownership and use of land also indicate an intensive kind of agriculture. In 1511, owners and users of every parcel of land were well known and land was classified as arable, hayfields, pasture or reed land as well as divided into different kinds of soil quality, like 'lowlands', 'highlands' (the difference often being only a few decimeters), 'newland' (land which was poldered more or less recently), 'dijkstalland' (land along the dyke) or terpland (land on the artificial hills on which most farms and villages were situated) etcetera. The rent level showed quite some correlation with the quality of the lands. When we compare the 1511 data on rents with present day geological maps, especially higher clay lands rich in calcium knew relatively high level of rents. Around the larger places, which counted a few thousand inhabitants, circles of land with a very high level of land rent can be witnessed. Early sixteenth century agriculture was already fairly intensive and specialized. This does of course not mean that no further intensification or specialization took place afterwards. Data on the development of the division of labour within Frisian cities after 1511 indicate a fast increase of the number of people involved in transport. In combination with the increase of urban population and improvements in the technology as well as the organization of transport this is a clear indication of increased transport and trade of agricultural products during the sixteenth century. Seventeenth century probate inventories contain much more shovels and spades than earlier inventories, which suggests more intensive land maintenance. During the first half of the sixteenth century, the largest farms – often located on monastic lands – slightly decreased in size, while the number of small farms increased. These data suggest that land became scarcer and was used more intensively. The level of specialization also increased. For some regions, it has been shown that the amount of pastures increased while the already fairly small amount of arable land decreased. After 1500, agriculture clearly intensified and specialized. But the difference between 1500 and 1650 was smaller than suggested by De Vries.

It is less clear if the farm households also specialized in core activities in agriculture shed all kind of side activities and made increased use of services of all kinds of craftsmen. Slowly, military tasks and obligations to take part in dyke maintenance disappeared from the household and became tasks of the state and specialized water management organizations. These last organizations were

funded by special taxes. Carpenters and cart- and wheelwrights must have been used more often by farmers. But this was probably caused by increased demand, instead of specializing households which shedded tasks to more professional and efficient craftsmen. Growth led to specialization instead of vice versa. The increased number of cartwrights is consistent with the increase of the number of wagons in probate inventories, the increased number of carpenters is consistent with the ever increasing size of farms buildings and the increased number of cask makers with increased transport flows. Also, tailors, weavers and bakers were omnipresent on the countryside around 1511. And sixteenth century probate inventories of farms do not mention a single loom, which is clear proof that at the latest around 1550, weaving was no side activity of farm households. At face value, there is little evidence of a specialization of farm households. In the long run, shedding activities did take place. Pasture farms shed the gathering of manure to make fuel. But this was not only a sign of specialization, but, as manure was put to fertilizing purposes, also a change in agricultural technology. As we have seen, this change was connected with changes in farm buildings, labour management, drainage technology and probably also dairy production and trade. The clearest change in the activities of the household which shows from the data even concerns the incorporation instead of the shedding of a craft. Between about 1560 and 1650, the number of spinning wheels in probate inventories of farms increased *tenfold*. And a number of the 1560 wheels were in fact not wheels but much less productive distaffs, which suggests that the change came about by the increase of productivity of spinning caused by the spread of the spinning wheel. The data show that increase of the number of spinning wheels took place regardless of the region or the size of farms. Spinning must have become a main occupation in these households, at least in the seventeenth century. An activity which did disappear was gathering manure and transforming this into fuel. Peat was used as fuel and female labour was freed and possibly used to make more dairy. In combination with the increased use of windmills to drain the lands, manure was now used to fertilize the lands. These improvements reinforced each other. The relatively low increase of the population of the pasture area indicates that the increase of production made possible by this change of agricultural activities went hand in hand with an increase in productivity. In arable areas, manure was already used to fertilize lands and the scope for improvement was smaller.

After 1580, a new phase of intensification and specialization started. The preceding decade had been characterized by war and severe floods. When peace returned, high arable prices stimulated the poldering of extensive stretches of coastal lands. The production of these fertile new polders was at least partly exported to Holland, where the economy and the population grew by leaps and bounds. In the nineties, rents as well as land taxes increased. Despite this, farmers

managed to pay their arrears, which in combination with increasing costs suggest a highly favorable development of agricultural income. It was also at bout this time that increasing number of migratory labourers started to flow into Friesland during the hay harvest. Despite this flourishing of agriculture, it is during these years that differences with Holland and Zeeland start to occur. Until about 1580, land rents in Friesland increased about as fast as in Holland and Zeeland. After 1580, the increase of rents in Holland and Zeeland started to outpace the increase in Friesland. Up to 1630, rents in the west of the Netherlands kept increasing faster than in Friesland, while within Friesland, rents of the farms of the Boelema guesthouse increased faster than rents of the productive Bildt area. Agriculture in Friesland flourished, but contrary to the situation in Holland no new economic sectors sprang into life. Frisian agriculture became peripheral to the economy of Holland. Instead of the production of final products like butter, fat oxen and cheese for consumers in the cities along the IJssel and in Holland, farmers also started to deliver intermediate products like hay, fat oxen, lean cows or, in spring, lactating milk cows. By buying these 'intermediate' products, farmers in Holland had to make less hay and, as making hay leads to quite some loss of nutrients, could change more of the nutrients delivered by their pastures into profitable final products.

The favorable economic circumstances led to ever increasing investments in farms and farm equipment. Increasing numbers of shovels and spades point to more meticulous maintenance of land. The consequences of the combination of larger investments in buildings and land in combination with some specialization on intermediate products for other producers became clear when economic circumstances in Holland deteriorated after about 1670. Prices of cattle from the clay area decreased much more than prices of cattle from the sandy soil area. After some years, prices increased again, but the pre-1670 level was not attained again. After 1670, population of the clay soil area decreased, which of course suggests a de-intensification of agriculture. Interestingly, the number of wagons owned by farmers continues to increase after this date. In the previous century and a half, transport of agricultural products had increased. Transporting goods has of course always been one of the functions of farm households. Around 1820, the clay soil farmer Hellema mentions that there was always a tension between using transport services provided by professional traders and the cheaper but time consuming option of transporting and selling butter, animals and cheese yourself. The increase of the number of wagons suggests that the downturn of the agricultural economy led farmers to spend more time on transporting their goods.

After 1695, signs of an improvement of the agricultural economy can be witnessed. All the rent series (including land tax) used in this study, most of which

deteriorated after about 1670, start to increase again.[638] Rents did decline after the downturn in the economy in the seventies. This decline was much smaller than comparable declines in Holland and Zeeland. After 1695, rents (including land tax) started to increase again. But the first two decades of the eighteenth century witnessed an unusual number of catastrophes. Several floods occurred, the 1717 one being the worst since 1570. On top of this, after 1712 agriculture suffered from a severe and prolongued outbreak of cattle plague. In many regions, 60 to 80 percent of the stock of animals died, while many farmers lost their entire herd. As arable farmers often also owned quite some cattle, they were affected too. From 1697 on, productivity series could be constructed.[639] These indeed show a low level of agricultural productivity during the first two decades of the eighteenth century. These series are constructed as a weighted average of several rents and wages series, deflated with (as much as possible) farm gate prices of agricultural products. Low levels can therefore be caused by low wages and rents, or by high prices. As rent contracts often lasted seven years, while wages of resident and, even more so, product prices were quite flexible, short term fluctuations are often caused by temporary changes in prices and, sometimes, wages. Long term changes, like the change after 1718, must be rated as an increase of productivity. The productivity increase of the twenties and thirties of the eighteenth century is consistent with increasing wages and increasing amounts of marketed butter. The cold summers and the cattle plague of the forties caused a new, but temporary, decline. Up to 1860, productivity does not seem to have increased again. As an increase of agricultural income can be caused by increased productivity as well as increased production or an improvement of the terms of trade, this stagnation of productivity does not mean that agricultural income also stagnated. Some time after 1750, things take a turn for the better. Around 1750, just after the second period of cattle plague, landowners still had difficulties to rent out parcels of pasture (as opposed to renting out farmsteads, which was not difficult). But surely after 1760 Frisian (and Groningen) farmers started to export more and more products to Great Britain and especially the London market. Population of the clay soil area also started to increase again, albeit faster in the arable areas than in the pasture areas. Despite bouts of cattle plague 1744-1748 and 1765-1788, the amount of marketed butter continued to increase, while increased demand for live animals gave farmers the opportunity to sell part of their remaining stock for highly favorable prices. The stock of cattle did show a long term increase which, in combination with an increased production of butter, shows increased productivity of pastures. As the increase of butter production was faster than the increase of the stock of cattle, productivity of milk cows also must have increased. Another important development was the

[638] Graph 5.1-5.5.
[639] Graph 8.2.

spread of potato culture after about 1760. This must have caused an increase of home production of food. Even on specialized large farms, home production of food (fruits, vegetables, beets, meat, milk, butter, cheese, grain and the like) continued to be very important till the end of our period. The introduction of potatoes must have caused a considerable change in the productivity of home production of food, for large farmers and labourers alike. Also, in some counties a swift rise of a class called 'aardappelaars', or 'potatoers' can be witnessed. These men hired relatively small amounts of land which were tilled intensively to produce potatoes or other 'coarse' vegetables like carrots, cabbages or beets.[640]

After 1770, this intensification of land use shows in a strong increase or the rent/wage ratio, defined as average rent for a hectare of land divided by the average daily summer wage of a labourer.[641] This increase took place despite a slight increase of the wage level in the same period. The increase of product prices and rents led owners of land to lease their land in public instead of by private negotiation. Just as 250 years before, a period of rising prices led to a change in customs and institutions with the same outcome: the owner of the lands could increase his or her share. Interestingly, developments in Friesland had in the previous centuries led to the development and continuation of a system of rack rents, while farmers on the neighboring clay soils of Groningen had managed, starting from a completely comparable position in 1580, to obtain hereditary rights to rent the lands and unchangeable rent levels. Intensification did not lead to an increase of productivity, but, as productivity stayed more or less level while more labour was used, it must have caused an increase of production. This period also witnessed improvements in agricultural practice in Friesland and Groningen, like the use of machines for sowing in rows, improvements in the design of drainage mills and investments in cellars to keep liquid manure. As early as 1755, mention is also made of successful vaccination of calves against cattle plague. Remarkably, we often know which farmers used these improvements first. And even more remarkably, these improvements were sometimes tested in a systematic, scientific way.

Between 1820 and 1830, a cadastral survey of Friesland was carried out. It is possible to compare this survey with the 1511 survey.[642] In 1511, patterns are visible in the rental value of lands. Especially the 'newlands' and lands directly

[640] As these parcels could change every year, the cadastral survey of the twenties of the nineteenth century did not classify them as horticultural lands but as arable lands and do not show up in the map of agricultural land use. Before 1760, there were some horticultural areas in Friesland and the post 1760 developments show that it was possible to hire small amounts of land, as is also shown by the existence of a class of koemelkers (cow milkers) around and in the cities, who hired some land, kept a few cows and sold fresh milk to the inhabitants of the cities. Before 1760, smallholding by labourers for subsistence or commercial production was quite limited in Friesland. After 1760, this was changed by the potato.

[641] Graph 8.1.

[642] Map 5.2 and 5.3.

around larger cities were characterized by high levels of rents. The picture is however somewhat vague. In 1830, all vagueness has disappeared. Details considering the kind of soil or the distance to a city show up. While, in 1511, well-kept expensive parcels could be situated next to less well kept but cheaper parcels which otherwise had the same characteristics, in 1830 this is not the case anymore. Every piece of land was improved and put to its best use. Drainage mills, intensive maintenance of land and ditches, the cumulative effects of centuries of tiny improvements and more extensive use of manure all played their part in this development. Probably, the effects of these changes reinforced each other. Significantly, in 1511 clay soil grasslands were universally divided into pastures and hayfields. Around 1830 this difference had vanished. Hayfields still did exist, but only on the peat soils adjacent to the clay soil area.

It is as yet not possible to make precise production estimates for the entire period. But it is without doubt that production increased strongly between 1511 and 1830. What caused this increase? For the eighteenth century we have productivity figures, which show a marked increase between about 1720 and 1740. It seems clear that this increase of productivity was largely caused by a recovery from the disasters of the first decades of the eighteenth century.[643] As production continued to increase after 1740, while productivity stayed more or less level, this increase must have been caused by increasing use of labour. This were new small scale farmers like the 'aardappelaars', but the larger part of this increased use of labour must have been located at existing farms. For the sixteenth and seventeenth century we do not dispose of productivity series. The increase of urban as well as rural population makes it clear that production must have increased. A part of this increase came from new polders along the coast. Another part must have originated from the 'old land'. Grass was (and is) by far the most important crop of Frisian agriculture. For grasslands, available data point towards a marked increase of productivity which originated in the sixteenth century and which picked up steam after about 1580. For the beginning of the nineteenth century, some data on productivity of grasslands are available. These data show that well-drained grasslands produced 40% more hay than badly drained grasslands, while the hay from the well-drained lands was also 40% more expensive, which results in a monetary productivity which is twice as high as the productivity of badly drained lands (1,4*1,4). As hayfields and parcels with reed disappeared from the clay soils and lands were used for hay as well as grazing, the improvement of grasslands may have led to a production increase of somewhere between 50 to 100%. The development of arable production is harder to investigate, partly because of lack of data and partly because arable yields are less stable than yields of grass. The new, fertile polders were mainly used for arable culture and, as

[643] The low level during the Napoleonic years is somewhat of a statistical artefact. As prices increased continuously while rents lagged behind this rise of prices, the deflated rent/wage index shows relatively low values.

rents in the Bildt are during the sixteenth and, to a lesser extent, during the seventeenth century were quite high compared with other rent series, it is fairly possible that productivity of Bildt farms also was quite high.[644] The scarce data available for the sixteenth century indicate that sixteenth century arable production was already quite productive. Arable lands probably also profited most of the enhancement of the dykes after 1570 and, again, after 1717. Around cities, the expensive area used by the burghers increased in size while the amount of horticultural land also increased somewhat. Both these tendencies must have increased agricultural production. A major boon to clay soil Frisian agriculture was, of course, the almost complete absence of war between about 1580 and 1830.

In 1830, compared with 1511, grassland in Friesland were more lush, dykes were higher, broader and safer, cows were more productive and arable lands were enhanced and maintained better than before. Farms were made of bricks instead of twigs, manure and loam. Fuel consisted of peat and wood instead of manure. Up to 1660, agriculture took advantage of the growth of the markets of Holland. And even after the economic downturn of the seventies, mention is made of exports of hay, butter and cheese and animals. After 1760, the growth of the London market caused demand for especially products which were produced abundantly in Friesland to increase. The differences between labourers and farmers had probably increased while the number of labourers relative to the number of farmers also increased, especially towards the end of our period. But at least during the hay making season, wages were high enough to attract thousands of migratory labourers, while during the last decades of the eighteenth centuries the development of the wage level in Friesland was les disastrous than in Holland. Considering this, Friesland was not always the worst place to be for labourers. Also, after 1760, potato culture had increased the possibilities for home production of food. Besides the increased number of labourers an extensive number of crafts- and servicemen like painters, blacksmiths, bakers, butchers, carpenters, cartwrights, wheelwrights and teachers, traders, millers, priests, doctors, constables and the like lived in the many small villages in the countryside. Many of these labourers and craftsmen lived in reasonably comfortable stone houses and were reasonably well fed. After 1580, they also lived quite peacefully. Technological developments in agriculture, improvements in trans-

[644] Rents alone do not suffice to estimate productivity. But as wage levels in the Bildt, an arable area, were probably equal to wage levels in other parts of Friesland – this opposed to wage levels in Holland or in the inland parts of the Netherlands – they can be used for a guesstimate of Bildt productivity compared with productivity of other parts of the clay soil area (graph 8.3). Between about 1590 and 1640, the Bildt farmers fought hard and long to change which in essence were rack rents into hereditary leasehold. Eventually, they lost. The struggle caused the Bildt rents to stagnate between 1590 and 1640, which is completely atypical for this period and which makes rents during this period less fit as economic indicators (they do, however, show the consequences of the flood of 1634).

port and trade, better dykes and improved dyke maintenance and better education had led to lasting improvements in material well being. Lokkich Fryslân.

De laatste Friese stinze, in Veenwouden. Aan het eind van de middeleeuwen waren de enige bakstenen gebouwen op het platteland de kerkjes en deze versterkte plaatsen, de Friese variant van het middeleeuwse kasteel. In de zestiende eeuw werd het centrale gezag in Friesland steeds belangrijker en verschoof de militaire macht van de hoofdelingen die op of bij deze stinzen woonden, naar dit centrale gezag. De stinzen werden daardoor overbodig. De meeste zijn daarna afgebroken en vervangen door (bakstenen) boerderijen of fraaie landhuizen, de Friese variant van 'van zwaarden tot ploegscharen'.