

Scattered land, scattered risks?

An empirical approach to the question of open fields as insurance: the case of Scania, 1750-1850

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Why was the arable in Medieval and early Modern Europe divided into small strips of land scattered over large areas within the system of open fields? According to one influential theory, advocated by Deirdre McCloskey, the main explanation was the reduction of risk. By spreading their efforts across land of different qualities and in different locations, peasants were less exposed to the caprices of nature, would it be heavy rains, floods, droughts, early frosty nights, or hailstorms. In her view, this arrangement could be a beneficial in a time with few or no alternative insurance institutions. In order to achieve this protection, peasants also had to pay a price since, according to McCloskey, the open field organisation reduced total agricultural output.

Since this theory was first put forward in the mid-1970s it has been debated and criticized from a number of angles. The crucial and until now unexamined question is to what extent the open field organisation actually reduced risk for the peasants of the time. McCloskey offered only *indirect* evidence supporting her suppositions. Her analysis was based on hypothetical calculations from annual harvest variations at the demesne level. She made no empirical tests comparing risk level on enclosed and open field land farms.

This present paper analyzes precisely the type of evidence McCloskey lacked: Long harvest series at the farm level including observations from both enclosed (consolidated) and open field (scattered) land. The study is based on tithe records from more than 1700 farms in Scania in southern Sweden 1715-1860, collected and made available for research by the Swedish scholars Patrick Svensson and Maths Olsson.

Results show that the open field organisation did indeed reduce risk. The reduction was, however, by no means decisive and can hardly in itself explain the viability of the system – and even less so if the loss of agricultural efficiency inherent in scattered land cultivation was as heavy as McCloskey has suggested.

Introduction

The open field system was for more than half a millennium the most common way to organize agriculture in large parts of Europe. Its basic features are well known. The arable was divided into a few large fields for each village. These fields were subject to communally-regulated crop rotation. When not under cultivation, the fields were used as a common grazing resource. Each field usually contained a large number of small strips, each of which was tended by one cultivator. Consequently, the lands of each peasant were scattered all over the village domain. In addition, in many regions, commons or wastes covered large areas of land. These were used as common resources for pasture, woodpicking, etc. In this paper, the use of the term *open fields* is restricted to the organisation of arable land, while the term *common fields* is used when referring to other types of communal land tenure, such as common grazing at the waste.¹

The open field system has been an object of debate since the time of its existence. For a long time, a pronouncedly negative picture dominated, originally put forward by the advocates of enclosures.² According to this tradition, it was a highly inefficient system. The scattering of land meant that a lot of valuable time was wasted in transporting material between the individual parcels. Weeds spread from one strip to another. Animal diseases thrived on the fields of common grazing. The communally regulated crop rotations were, in this context, understood as a straitjacket hindering the introduction of modern farming technology, threatening to kill every private initiative. As a consequence, peasants were left in a state of chronic backwardness. The fact that this system could dominate European agriculture for so many centuries was mainly considered a consequence of a conservative mindset and institutional hindrances. According to one influential theory, the system should be understood as the outcome of an egalitarian ideology among primitive tribesmen.³ Later, a more evolutionary perspective on the open fields emerged. In the 1960s, Joan Thirsk identified piecemeal land reclamation and the subdivision of land due to partible inheritance as driving forces behind the system's gradual expansion.⁴ It was, however, not until the 1970s before historians began to seriously debate the potential benefits of the open fields.

In the following debate three main positions can be identified. According to Carl J. Dahlman, the primal advantage of the open and common fields was that they enabled an economy of large-scale grazing.⁵ After harvest season and a fallow year, the arable land was turned into a vast communal resource of pasture. According to Dahlman, grazing is an activity subject to economies of scale. The larger the stock and the wider the pasture area, the more productive the system of grazing. One important factor in this context was that communal grazing could cut the costs for herding and fences to a minimum. Even the organisation of the arable land into strips divided among the villagers was according to Dahlman due to the logic of large scale grazing. When each peasant held a number of small, scattered plots, it was a far less tempting option to withdraw

¹ The use of these two terms has not always been consistent. See for example Feodaltea 1988: 171; Renes 2010: 38-40; and Bailey 2010: 156.

² For a number of English examples from this tradition, see Allen 1992: 2-5. In Sweden, for example, Heckscher (1941) influentially advocated a similar view.

³ Vinogradoff (1892); Maitland (1897); Gray (1915).

⁴ Thirsk 1964; Thirsk 1966.

⁵ Dahlman 1980.

from the system of common grazing. This way, the survival of a system that benefited everyone was ensured.

Stefano Fenoaltea and Deirdre McCloskey represent the other two debate positions. Both authors identified the scattering of land, rather than common grazing, as the core of the system. When land was spread out in small parcels all over the village domain, the individual farmer could exploit a mixture of different types of land. According to Fenoaltea, this arrangement enabled farmers to organise agricultural labour in the most efficient way possible.⁶ Due to varying natural conditions, the pace of growth varied considerably from one piece of land to the other. Often, performing the right farming task at exactly the right moment was of the utmost importance, especially during harvest time, when the difference between an unripe and overripe crop could be a matter of days. By spreading out land in small parcels all over the village, peasants could achieve an optimal use of labour in time and space.

For the third author, McCloskey, whose theories will be at the fore in this article, the scattering of land was instead a question of risk management.⁷ By holding land of different qualities and in different locations, the individual farmer was less exposed to the risk of a severe harvest failure, where half the annual crop or more was destroyed, leaving the family in a situation of famine and poverty. Importantly, this theory argues that such harvest failures often most affect certain types of soils: dry ridges in a year of drought or wet basins in the in a year of heavy rainfalls. The spreading out of land was from this perspective also the spreading out of risks. But in order to achieve this risk reduction, peasants had to pay a price. Thus, according to McCloskey, overall productivity was considerably lower in open fields compared to within a consolidated farming regime. Given the fact that farmers of the time had access to few other insurance options, this was still an attractive option.

These arguments have all come in for questioning in the subsequent debate. McCloskey's notion of the open field farm as essentially inefficient was largely inherited from 18th and 19th century advocates of enclosure. This view contrasted sharply with Fenoaltea's view, which understood the scattering of fields as an effective way of adapting agriculture to variable natural conditions.⁸ More recently, Robert Allen has contributed to restoring the reputation of open field farming, dismissing the previously dominant negative view of this system as "agrarian fundamentalism".⁹ At the same, Fenoaltea, Miles Kimball, Gary Richardson, and others have identified other institutions for risk reduction accessible to medieval and early modern peasants, such as grain storage, fraternities, customary poor laws, and relief from the state or noble landlords.¹⁰

In comparison, less criticism has been directed at the heart of McCloskey's theory: the idea of open fields as way to spread risk. Robert Allan tends to take this idea almost for granted.¹¹ It is also largely accepted by Fenoaltea, though he only employs it as a secondary explanation.¹² But to what extent did the scattering of land actually protect peasants and their families from economic

⁶ Fenoaltea (1988) summarizes a position, previously developed in a number of publications.

⁷ This paper will mainly discuss the argument put forward in McCloskey 1976. McCloskey 1975, 1989 and 1991 present a similar interpretation.

⁸ Fenoaltea 1988.

⁹ Allen 1992.

¹⁰ Fenoaltea 1988: 200-209; Kimball 1988; Richardson 2005.

¹¹ Allen 2001: 43.

¹² Fenoaltea 1988: 215.

disasters and famine? McCloskey presented highly precise numbers. The risk for a severe crop failure, defined as less the half of the normal yield, declined by 30%.¹³

A closer look at these figures, however, reveals that they rest on a chain of hypothetical assumptions with a weak empirical core. McCloskey made use of annual observations of yield ratios for wheat, barley and oats for 40 demesnes within the Winchester estates over a 15-year period, from 1335-1349.¹⁴ Her analyses did not consider any observations from peasant farmers, and open field and enclosed land farming was never compared. As Charles Wilson has noted, the study also failed to clarify whether the demesnes in the study were part of any open field system or farmed separately.¹⁵ The basic method employed was to mathematically simulate effects of scattered land holding compared to consolidated farms from levels of variance in harvest between different crops, years, and demesnes. In the end, McCloskey's results depended on the assumption that the variations in yield between individual strips of land corresponded to the variations in yield between individual demesnes.

In the subsequent debate, Bekar and Cull, Hoffman & Hughson have presented other studies measuring the effects of scattering on risk levels within medieval and early modern agriculture. Baker's contribution consisted of a reutilization of McCloskey's sources and methodology, extending the analysis in time.¹⁶ Cull, et al. offered a different approach; their study used yearly yield records from 27 individual parcels of land in 18th century France.¹⁷ Both studies conclude that land scattering did not reduce risk to the high extent posited by McCloskey. To our knowledge, no studies have yet been made comparing actual empirical outcomes within a scattered and consolidated farming regime.

Sources and methodology

This article is based upon precisely the kind of material McCloskey would have needed in order to empirically substantiate her theory: long time series of observations of yearly farm-level yields, where lands cultivated under the open field system can be separated from land cultivated under the enclosed regime. The material used is from the freely available database, "Historical Database of Scanian Agriculture" compiled and published by the two Swedish economic historians Maths Olsson and Patrick Svensson.¹⁸ Data in the database is culled from tithe records from 37 Scanian parishes, from 1700-1860. The scale of the collected material is enormous. While McCloskey based his articles on evidence from 40 demesnes over a decade and a half, this article will make use of more than 45,000 harvest observations from more than 1,700 individual farms.

At the empirical core of the article is the phenomenon of the *variable tithe*.¹⁹ The principle that each peasant should cede 10 percent of his yearly gross-harvest to the church was established already in early Christianity. With the Lutheran Reformation, two-thirds of the tithe was usurped

¹³ McCloskey 1976: 132.

¹⁴ McCloskey 1976: 134-136; 141-145. The same material was reutilized in McCloskey 1989.

¹⁵ Wilson 1979: 195

¹⁶ Bekar 2001.

¹⁷ Cull, Hoffman & Hughson 1992.

¹⁸ The database is available at <https://www.ekh.lu.se/en/research/economic-history-data/HDSA-1702-1881>. For a presentation of the material see Olsson and Svensson 2017.

¹⁹ On Swedish tithes, see Olsson & Svensson 2017 and Palm Hallberg, Lejonhufvud & Linde 2016

by the state. The remaining third was, however, still reserved for the local vicar and made up an important part of his salary.

Over the centuries, both the state's and the vicar's part of the tithe in most Swedish regions was fixed in set quantities of grain. The tithe paid was therefore not affected by good or bad harvests. In contrast, in most of Scania the vicar's part of the tithe remained variable until the mid-19th century. In practice, this meant 1/30 of the gross harvest belonged to the vicar. As the tithe was set at the farm level, the collection records thus offer information on yearly harvests on a large number of individual farms. In addition, the database includes information on whether farms passed through the 18th and 19th century Swedish land reforms: *storskifte*, *enskifte* or *laga skifte* (see below). As a consequence, it is possible to calculate farm-level variation in yields within the different farming regimes that existed in the province during the period, which were characterized by different levels of land scattering.

One critical issue for the investigation is to which extent the collected tithes actually corresponded to real harvests. Obviously, it was in the interest of the individual taxpayer to underestimate their yields, to get away with paying a low tithe. Were the vicars really able to monitor harvests at each and every farm in their parishes? Given the high costs and the many practical and political problems involved in the vicars' surveillance of his parishioners, **it must** have been easy at hand for informal practices to develop. Though technically set at 1/30 of the harvest, one might therefore suspect that the actual tithe was often decided in a series of negotiations between the vicar and the peasants. In such a situation, the tithe would no longer directly correspond to actual field harvests.

Despite these problems, Olsson and Svensson convincingly argue for the credibility of the material.²⁰ Typically, the tithe was collected at the field after harvest, while the grain was left to dry in stooks and sheaves. The vicar or his local agent went from field to field and picked one of every thirty sheaves. And even if practices varied from one region to another, it is possible to identify the areas where the tithe was variable in theory as well as in practice. In total, there were over 400 parishes in Scania during the studied period. Among them, Olsson and Svensson have identified the 37 parishes that offer the most reliable and well-preserved sources. In the process of compilation, they have also performed a number of statistical tests on the material. Harvest series that raise the suspicion of not being based on actual annual yields have been omitted. After publication, the database has been tested in a several empirical investigations.²¹

Preparations for this article have included a review of harvest series from each individual farm in the database. As a result, approximately 3 percent of the entries have been excluded from this investigation, in most cases due to the fact that the level of interannual harvest variation is lower than what could be considered reasonable. In general, however, the outcome of the review is highly satisfactory. Harvests at the farm level vary from year to year in an irregular and unpredictable pattern. If individual farms within a parish or a village are compared, they follow a similar but not identical development. This pattern is important, as it rules out the possibility that tithes were negotiated at the village level, later to be apportioned between the farmers according to the size of the farms. The general variation in yields also corresponds with data in

²⁰ Olsson & Svensson 2017: 7-12; 17. See also Olsson & Svensson 2011 and 2016; and Boman 2010: 13-21.

²¹ For example Olsson & Svensson 2011; 2016; Bohman 2017.

other published harvest series, based on other types of sources – including Titow’s harvest series from the Winchester estates, McCloskey’s principal source.²²

A few words should be said about the time-space dimension of the material. The 37 parishes in the database represent a variety of natural conditions and farming practices. However, no parish offers uninterrupted data covering the entire period under study. In practice, the geographic composition of the database changes over time. The best level of coverage is achieved during the period 1790-1830. Fortunately, these years coincide with the most intensive period of land reforms and the coexistence of several different farming regimes in the region.

The grain measurement used in the database is the *stook*. Stooks have been converted to hectolitres in accordance with a methodology developed by Olsson & Svensson.²³ In order to take the different value of different crops into consideration in the calculation of the total annual harvests of the individual farms, the cereals have been weighted in accordance with the measurement used during the time studied, *ren säd* or “rye-equals” (see figure 1).²⁴

Once the harvest series for the individual farms were established, they were organised in overlapping nine-year series, using every individual year of the investigation as a starting point. These nine-year series have been used to calculate the coefficient of variation in gross harvests at the farm level and the frequency of disastrous harvests (defined as a gross harvest 30 percent or more below the average harvest during the preceding and following four years of the nine-year period). It could be argued that harvest series of nine years are too short – they are, for example, rather sensitive to strongly divergent years. However, longer time series would have faced other problems, such as an increased sensitivity to long-term changes in harvests (due to, for example, land reclamations) and the elimination of harvest series from the investigation due to lack of uninterrupted data. With the use of nine-year series, the statistical power of the database can be maintained. The ambition is to compare cohort harvests in exactly the same years. One-year lacunas in the source material have only been accepted under certain conditions. As a general rule, no results are presented unless they are based on a minimum of 25 observations from at least four villages.

There is one important qualification. This is a study on the *variation* in harvest outcomes on scattered and consolidated holdings. The question of *overall productivity* within the two regimes will *not* be addressed. Such an investigation would have required another methodological approach. The question of overall productivity within the different farming regimes is, however, still of *indirect* importance to this investigation. According to McCloskey’s estimations, productivity was approximately 10 percent lower within scattered regimes compared to consolidated ones.²⁵ This was the price paid by open field farmers to reduce risks. But such an exchange could only be rewarding if risks were *substantially* lower on open field land.

²² Over all variation of total *gross* yields 1715-1846 is at 19,8 % according to this present investigation (see table 1). Variation in Titow’s 1792 material from the Winchester estates is at 20,1 % (based on the figures for gross yields/acre under the assumption that wheat, barley and oats were sown under equally large areas) if an as similar methodology possible as the one used in this investigation is employed. Comparisons with published Swedish harvest series (Palm 1997; Carlsson, Nyström & Palm 1998) have given similar results.

²³ Olsson & Svensson 2017: 15-16.

²⁴ After Gadd 1983: 90, 92.

²⁵ McCloskey 1976: 132.

Background: the studied region; the land reforms

The province of Scania is located in southernmost Sweden, just east of the narrow water passage between the Baltic and the Kattegat seas (map 1, page 23). Up till 1658, this was a Danish province. Compared to the rest of Sweden, the region enjoys a mild climate and favourable conditions for arable farming; in the Southwest corner of the province are some of the most fertile soils in Europe. From a wider geographical perspective, the province can be seen as part of a Northwest European belt of arable farmland, stretching from northern France over the Netherlands, Denmark, and Northern Germany. In accordance with older traditions, the historical database of Scanian agriculture covers three sub-regions within the province.²⁶

The *plain land* areas in the West and South constitutes the best region for arable farming in Sweden. During the early modern period, the area harboured villages of considerable size, usually organized in a two- or three-field system. The level of land scattering was high. Each farm typically possessed 50-100 strips of land.

In the *forest regions* in the inland and the north settlements were less concentrated. Most villages were small and, in addition, there were a considerable number of solitary farms. Large woodland commons, providing valuable resources of timber, firewood, and pastures, often separated farms and villages.

Finally, there was there was also an *intermediate zone*, the so-called “twig land district”, *risbygden*. The name refers primarily to the fences that were typically made of dry branches – but it also captures the character of the area’s bushy landscape. This region hosted vast pastures, but arable farming was also of vital importance.

The variable farming conditions within the province are a potential methodological problem for the investigation. Given the differences between, for example, the plains and forests region, should each of them not be studied separately? However, crosschecks in the material indicate that the differences in agricultural risk level – the main unit of analysis for this investigation – were very small.²⁷ Given this, it makes more sense to study the whole province as one unit.

During the studied period, Scanian agriculture passed through a period of rapid transformation. Arable land was constantly expanding, making grain the main specialisation in most of the province. During the first half of the 19th century, the traditional crop rotations were gradually replaced by convertible husbandry, first on the fertile plains in Southwest, and later in other parts of the province. On the noble holdings, large quantities of land were either sold off or transferred to large consolidated commercial farms. At the same time, three consecutive state-initiated land reforms eventually ended the system of open fields: the *storskifte* (1757-1827), the *enskifte* (1803-1827) and the *laga skifte* (1827-1926).²⁸

The three land reforms will be commented upon in more detail later. However, it should be mentioned that while the *enskifte* and the *laga skifte* resulted in the final dissolution of the open fields system, the *storskifte* reform should be considered a reform within the system. Its main result was a drastic reduction in the number of land strips belonging to each farm. In this article,

²⁶ See Boman 2010: 49-66 for a detailed presentation of this division and of the three sub-regions.

²⁷ Average variations 1760/69-1829/37 were: 18,6 (plains), 19,0 (intermediate zone) and 17,4 (forests). Correlations in the level of variation between the three regions are at 0,57, 0,61 and 0,79.

²⁸ On the land reforms see Gadd 2011 and Nyström & Hallberg 2017. On Scania, see Olsson & Svensson 2011, Svensson 2005 and Bohman 2010.

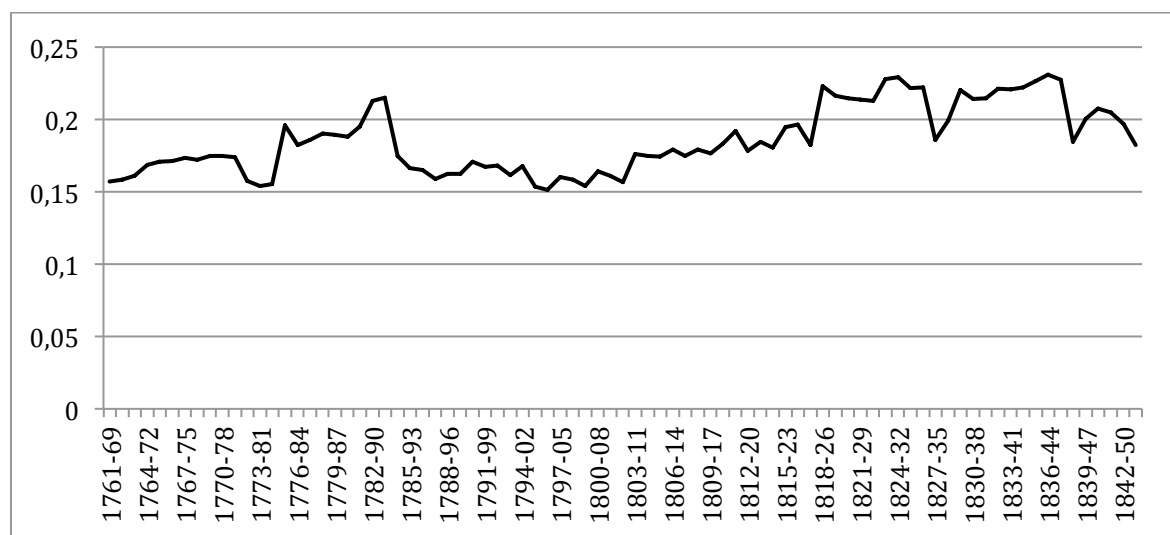
and that passed through the *storskifte* reform will be referred to as *reformed open fields*; land transformed by the *enskifte* or *laga skifte* reforms is termed *enclosed*. In addition, *solitary farms* will also be studied. Such farms were almost exclusively located within the forest region.

In total, four different categories of land will be used in the investigation, representing three levels of land consolidation: scattered farms (on open fields), semi-consolidated farms (on reformed open fields) and consolidated farms (enclosed land and solitary farms). Did these levels also correspond to different levels of risk exposure?

Harvest variations

A cornerstone in McCloskey's articles was the analysis of harvest variations. Figure 1 presents the development of risk levels in the Scanian material from 1760/69-1843/51, measured as coefficients of variation in overlapping nine-year periods.

Figure 1: Variations in gross harvests in the research area 1760/69-1843/51: the overall picture. (Average of farm level coefficients of variation over overlapping nine-year periods)



Source: Historic database of Scanian agriculture. Note: Co-efficient of variation in total harvest output during overlapping nine-year periods. Stooks transmitted to hectolitre following Olsson & Svensson's (2017: 15-16) methodology; different crops weighted as *ren säd* ("rye equivalents"): Rye and barley = 1; wheat = 1,33; mixed grain (barley and oats) = 0,67; Oats = 0,5 (after Gadd 1983: 90, 92). No other crops are included. One-year lacunas are accepted in the position no 2, 3, 4, 6, 7, and 8 of the nine-year intervals, except for years with exceptionally good or bad harvests at the province level. Minimum of 25 observations from four different villages.

It should be noted these values are measured from the *gross* harvest, which includes the seed. If *net* harvest had been measured (as done by McCloskey), figures would have been considerably higher.

The level of variation fluctuates between 16 and 23 percent. Over time, there is a clear upward tendency in the risk levels, especially from the early 19th century onwards. Could the land reforms explain this development? Due to the rapid advance of enclosure after the 1803 *enskifte* edict, a large number of Scanian farms were transformed from scattered to consolidated holdings

during this period – which, in accordance with McCloskey’s theories, should also result in increased farming risk. In the following sections, the effects of the *storskifte*, *enskifte*, and *laga skifte* land reforms will be examined with this argument in mind. First of all, however, risk level within the solitary farms in the forest region will be compared to open field farms in the same region.

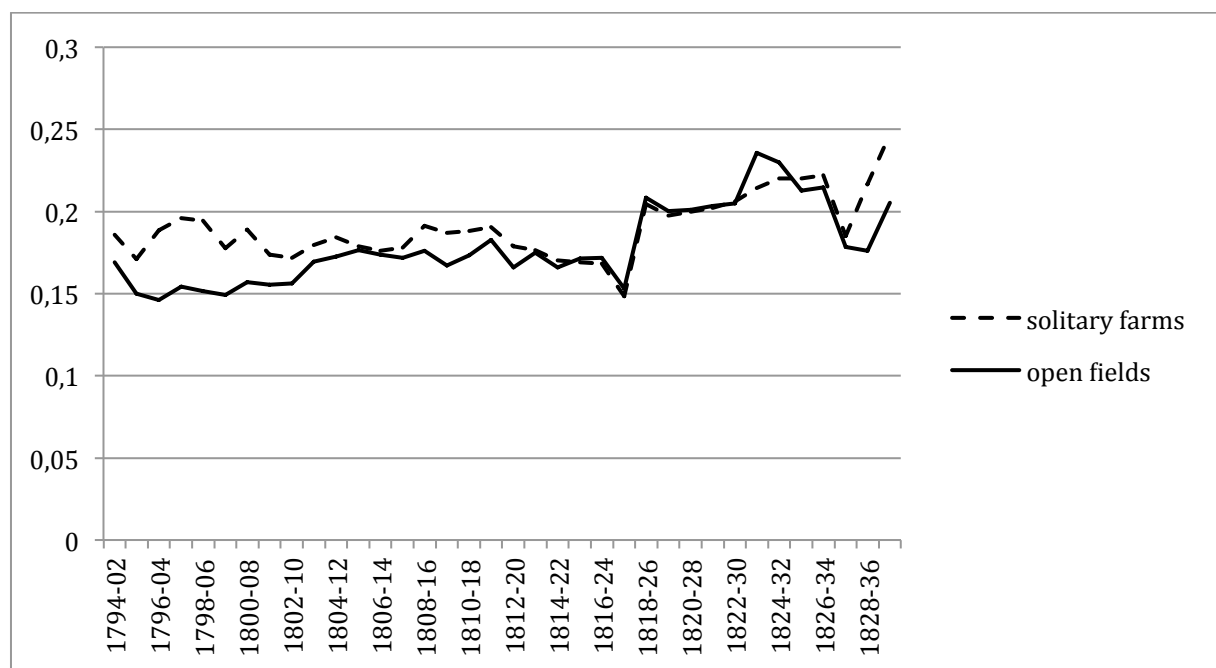
Open fields vs. solitary farms

Amidst a discussion on enclosures and open fields, it easy to forget that, prior to the process of enclosure, many farms were in fact farmed outside of the open field system - namely the solitary farms.

Map 3 (page 24) pictures one such farm: Ströröd in Billinge parish, charted by a land surveyor in 1744. At that time, the farm was comprised of 5 hectares of arable land, divided into two separately-fenced fields. In addition, the farm possessed large meadow and forest areas. Worth noticing is that there were no fences separating the farm from neighbouring farms on these categories of land. The animals must have been able to walk across farm borders. From this perspective, the farm could be defined as part of a common- but not of the open field system.

In the database, the first observations from solitary farms appear in 1719. It is not until the turn of the century, however, that we have enough observation for solid statistical analyses. In Figure 2, the development of risk levels at solitary farms and on open field farms in the forest regions are compared over the following decades.

Figure 2: Variations in harvests on open field farms and solitary farms within the forest farming region 1794/1802-1829/37. (Average of farm level coefficients of variation over overlapping nine-year periods)



Sources and notes: see figure 1.

Differences between the two categories are small; during some periods, shifts follow an almost identical trajectory. Both regimes also follow the previously discussed trend of increased risk levels during the early 19th century, which indicates that this development cannot have been solely the effect of the land reforms. The overall tendency is that harvests varied *slightly* more on solitary farms compared to the open fields. On average, from 1798 to 1833, the coefficient of variation is 7 percent higher on this category of land.

Open fields versus reformed open fields

The first major Swedish land reform was the *storskifte* reform, from 1747 to 1827. The most revolutionary effect of this reform was arguably the enclosing of the commons in parts of the country²⁹ When it came to the open fields, the results have often been portrayed as a “half measure”. Common cropping systems, fences, and grazing prevailed. However, the number of strips that belonged to each farm were drastically reduced.

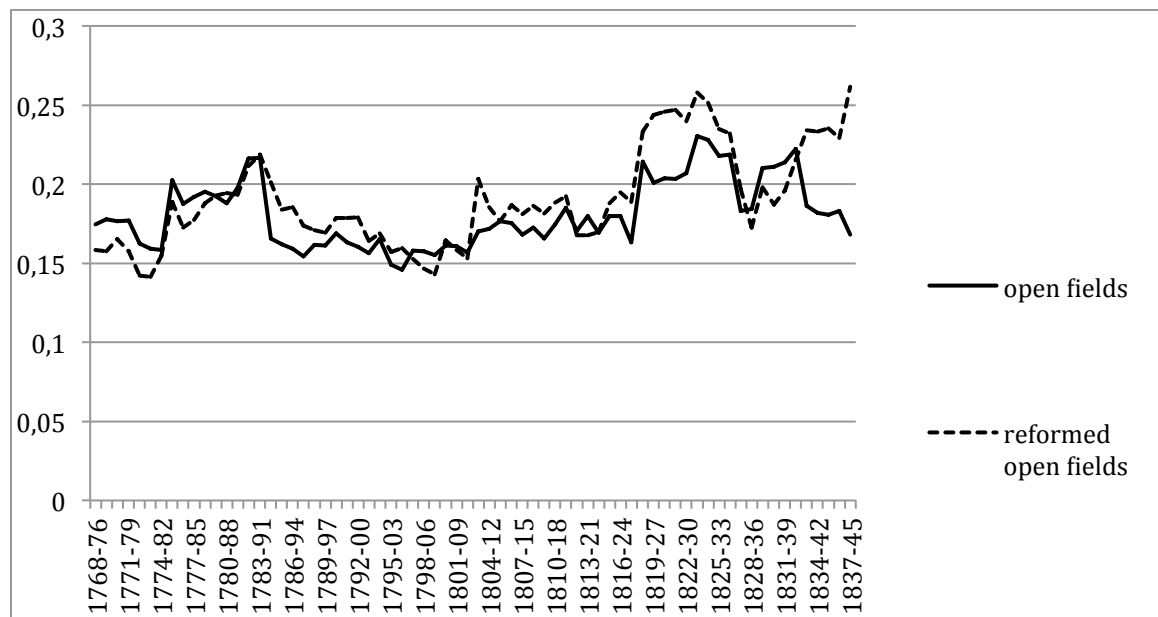
Maps 4-5 (page 25-26) show the effects of one of the villages in the database, Lilla Harrie, located within the plains region north of Lund. This was an area characterized by the traditional three-field system. Worth noticing is the lack of fences on the borders between neighbouring villages. Such an absence indicates that grazing and crop rotations integrated several open-field villages in the area.

The 1780 *storskifte* partition shown in Map 4 (page 25) did not alter this organisation. However, every farm’s number of arable strips in every field fell from an average of 10-12 to 2-4. Map 5 (page 26) zooms in on a small area in the western field. Here, both the old (fine lines) and the new (wider lines) structure of parcels can be distinguished.

The *storskifte* reform was implemented in a considerable share of the villages in Scania. From the 1770s and onwards, there is enough data in the database to analyse how agricultural risk levels were affected by the reform. Developments within this regime and on the (non-reformed) open fields are presented in Figure 3.

²⁹ See Hallberg 2013.

Figure 3: Variations in harvests on open and reformed open fields, 1768/76-1837/45 (Average of farm level coefficients of variation over overlapping nine-year periods)



Notes and sources: see figure 1.

With the exception of the earliest period of study, harvests in the reformed open field system varied more than on the open fields unaffected by the reform. On average, risk levels were 5 percent higher.

As in the case of the solitary farms-open field comparison, it is questionable whether the difference was big enough to be of any importance to farmers of the time. The gains in terms of reduced scattering must be considered sizable, compared to the moderately increased risks levels after the reform.

Open fields versus enclosed land

In retrospect, the phenomenon of reformed open field was a short parenthesis in Swedish agrarian history. Already in the late 18th century, a reform movement started to take shape which, within half a century, would result in the definitive end to the open field system in southernmost Sweden.

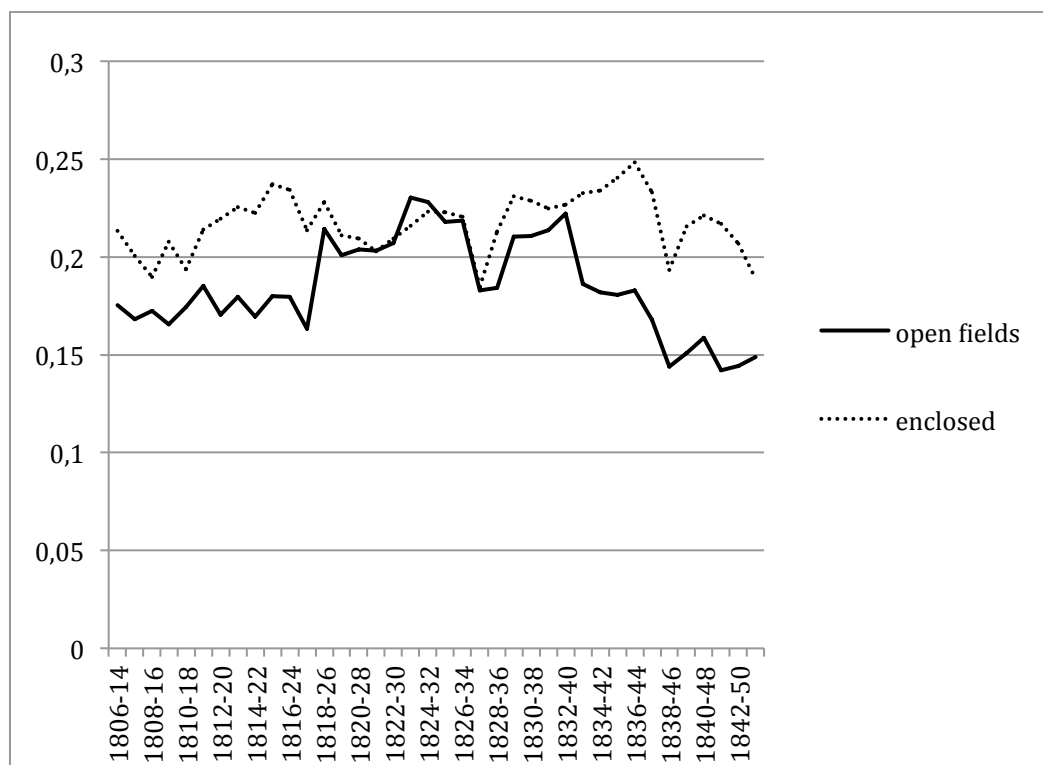
The first large-scale enclosure was realised as a private initiative on the Scanian estate of Svaneholm in 1783. During the follow twenty years, an unknown number of villages in the southern and western parts of the province followed this example.³⁰ Legally, these early enclosures were based either on unity of possession or on the *storskifte* edict that from 1783 forwards made it possible for landowners to break up rather than reform the opened fields. It was, however, not until the adoption of the more decisive *enskifte* edict of 1803 that enclosures gained

³⁰ The phenomenon, and some of the enclosures realised before the establishing of the *enskifte* edict in 1803 is discussed in Svensson 2005.

momentum. During this and the following *laga skifte* edict of 1827, most villages in the province were gradually enclosed.

Map 6 (page 27) shows the effects of the 1809 *enskiye* enclosure in the previously presented Lilla Harrie village. As can be seen, there are no longer any traces left of the open fields. All the land has been divided into consolidated farms. How did such a shift affect risk levels in agriculture? In Figure 4, harvest variations on enclosed and (non-reformed) open field land is compared.

Figure 4: Variations in harvests on open field and enclosed land 1806/14-1843/51 (Average of farm level coefficients of variation over overlapping nine-year periods)



Sources and notes: see figure 1.

Out of the 38 intervals where the two farming regimes can be compared, enclosed land farmers faced higher risk levels in all but six. On average, harvests on enclosed land varied 17.6 percent more than on the (non-reformed) open fields. This is, so far, the most marked difference in the study.

However, if the enclosed regime is instead compared to the *reformed* open fields, this difference shrunk. Harvests on enclosed land varied only 4.1 percent more than harvests on land farmed under the system established by the *storskiye*-reform.

Table 1 summarizes the results from an investigation of harvest variations across different categories of land.

Table 1: Harvest variations: comparison between the different farming regimes over comparable periods of time

Farming regime	variation	A=100
1. All farming regimes, 1710/18-1843/51	19.8	
2. Solitary farms vs open fields (forest region 1794/1802-1829/37)		
A Open fields (non-reformed)	17.9	100
B Solitary farms	19.0	106.5
3. Reformed vs nonreformed open fields (1768/76-1837/45)		
A Open fields (non-reformed)	18.1	100
B Reformed open fields	19.0	105.2
4. Enclosed land vs nonreformed open fields (1806/14-1843/51)		
A Open fields (non-reformed)	18.5	100
B Enclosed land	21.7	117.6
5. Enclosed land vs. reformed open fields (1806/14-1837/45)		
A Reformed open fields	21.1	100
B Enclosed land	21.9	104.1
C Open fields (non-reformed)	19.2	91.0

Note: Variation is measured as coefficients of variations at farm level over overlapping nine-year periods. The average of each nine-year period and cohort have been used in the calculation of averages for longer periods. See figure 1 for other details on sources and methodology.

The risk for a severe crop-failure

So far, this analysis has shown that scattering land within open fields indeed reduced the variation in harvests – although nowhere near the extent suggested by McCloskey.

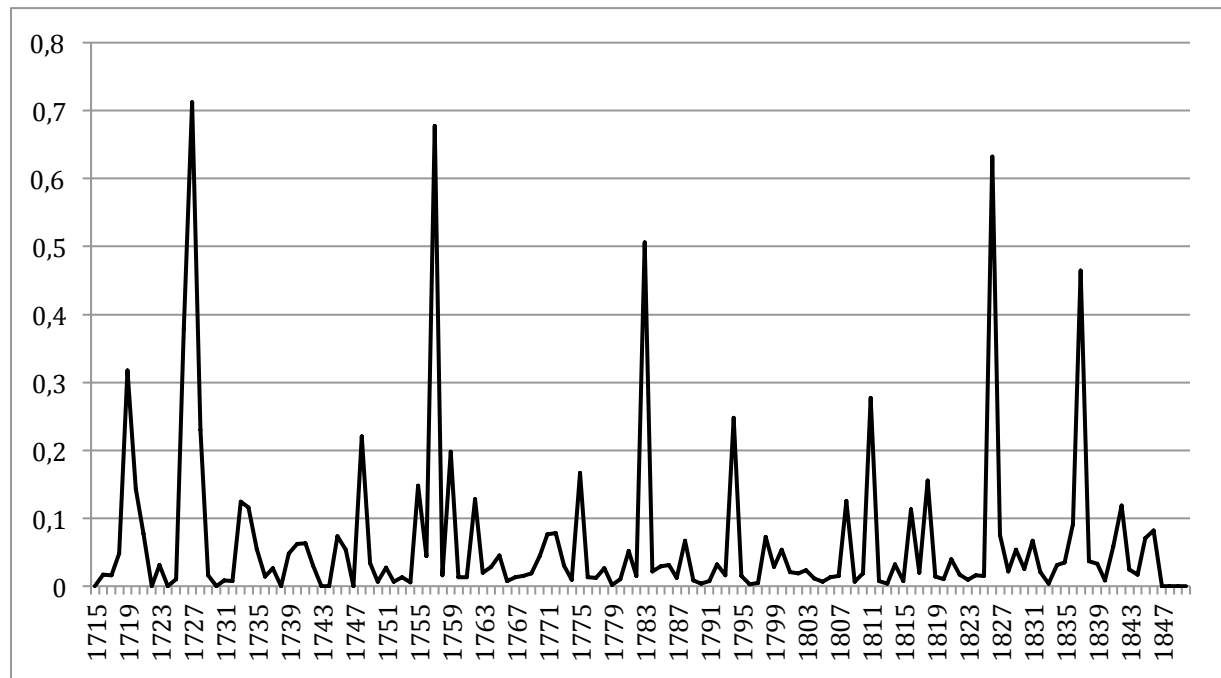
For farmers of the time, however, it was not the reduction of the variation that counted but whether disastrous harvests could be avoided. This aspect is also in the fore in McCloskey's investigation. In the analyses of the Winchester yields, she sets the limit for a severe crop-failure harvest at 50 percent of the normal *net* harvest. According to her calculations, the probability of this happening was 10.8 percent at a consolidated farm, compared to 7.5 percent at a scattered holding. Roughly one out of every three harvest disasters could thus be avoided with an open field organisation.

This investigation will define the severe crop failure differently. As the database used contains no information on seed, only the *gross* output can be measured. Out of the gross harvest, roughly 10 to 25 percent (depending on period, area, and crop) must be set apart as seed for the coming year. Taking this condition into account, the limit for a disastrous harvest has been set at 30 percent below the normal harvest yield. It could be argued that this definition is wider than

McCloskey's. Still, only 6.6 percent of all harvest observations within the database meet the criteria.

Figure 5 presents the percentage of farmers suffering such a severe crop failure each year over the period from 1715 to 1850.

Figure 5: Harvests failures 1715-1850: Percentage of farms with a gross harvest at 30% or more under the normal.



Note: The normal harvest has been defined as the average harvest over the four preceding and following years in relation to the year of observation. See figure 1 for other details on sources and methodology.

The figure illustrates a well-known pattern of traditional farming: catastrophic harvests interrupted the sequences of good or decent years at 10- to 20-year intervals. The necessity for farmers of the time to cope with this unpredictable situation was in fact the starting point for McCloskey's theory. But while McCloskey studied harvest variation mainly as an inter-strip phenomena, what can be seen on the graph is first and furthestmost an inter-year phenomenon. Of all the severe crop failures documented in the database, the majority are concentrated in the nine years when harvests in the province were generally very bad (1719, 1727, 1748, 1757, 1783, 1811, 1826, and 1837). In any one of these disastrous years, a high degree of scattering at the local level must have been less of a remedy.

Given this pattern – and also considering the fact that, as previously shown, overall harvest variation differed very little between the different farming regimes – it is hardly surprising that the open field system proved to be of limited protection against severe crop failure. Table 2 presents differences in performance across different types of farms.

Table 2: The probability of a harvest disaster within the different farming regimes, 1715-1850.

Farming regime	Probability of disaster	frequency of disaster	A=100 (probability)
1. All farming regimes, 1715-1850	6.7%	every 14.9 years	
2 Solitary farms vs. open fields, 1798-1832 (forests)		every	
A Open fields (non-reformed)	5.8%	17.2 years	100
B Solitary farms	6.2%	16.1 years	107.6
3 Reformed vs. non-reformed open fields, 1772-1841		every	
A Open fields (non-reformed)	5.6%	18.0 years	100
B Reformed open fields	6.5%	15.5 years	116.5
4 Enclosed land vs. open fields, 1810-1846		every	
A Open fields (non-reformed)	6.6%	15.2 years	100
B Enclosed land	7.2%	13.9 years	109.4
5. Enclosed land vs. reformed open fields, 1810-1841		every	
A Reformed open fields	8.5%	11.8 years	100
B Enclosed land	7.3%	13.7 years	85.7
C Open fields (non reformed)	6.9%	14.5 years	80.8

Sources and notes: see figure 1 and figure 5. Data adjusted so that each year of study is weighted equal.

As seen in the table, open-field farms do indeed come best out of the comparison. The difference compared to consolidated farming on enclosed land or solitary farm is, however, negligible. While McCloskey estimates the disaster-saving effects of the scattered holding at 30 percent, the effects according to this study stopped at approximately 8 to 9 percent, based on the comparison between open fields and enclosed land or solitary farms. The farmers facing the highest risk of a severe crop-failure were in fact found on the reformed open fields – where land was still scattered. From this perspective, it could be concluded that the open field system could not reasonably have functioned primarily as an insurance institution.

It is, however, possible to take the analysis one step further. Table 3 separates the years of general severe crop failure from the years when no such catastrophe occurred. The data stretch over the period 1810-1841, when we have enough observations to follow development on open fields, reformed opens fields, and enclosed land alike. During this period, harvests in the province dropped 20 percent or more on three occasions: 1811 (draught), 1826 (draught), and 1837 (late and cold spring).³¹ How did the different farming regimes perform during these years, in comparison to years with good or at least decent harvests?

³¹ Reasons for crop-failures after Utterström 1957: 429-45.

Table 3: Performance of open field, reformed open fields and enclosed farms during disastrous and non-disastrous farming years 1810-1841

Category of year	Category of farms	Yield/ average yield	Frequency of severe harvest failures	Share of total number of severe crop failures suffered
Non-disastrous years	Open fields	104.2%	2.8%	37.3%
	Reformed open fields	104.7%	3.6%	38.1%
	Enclosed land	103.6%	4.3%	52.9%
Disastrous years (1811, 1826, 1837)	Open fields	71.6%	46.8%	62.7%
	Reformed open fields	67.3%	56.4%	61.9%
	Enclosed land	74.3%	36.8%	47.1%

Sources and notes: see figure 1 and figure 5.

The results are interesting. During the non-catastrophic years, we find support for McCloskey's theories. The probability of a disastrous harvest is low on open fields (where the level of scattering is high), high on enclosed land (where there is no scattering), and middling on reformed open fields (scattered, but to a limited extent). The differences between the categories are substantial. The risk of severe crop failure was more than 50 percent higher for a farmer on enclosed land than a farmer on open field land. These numbers are even greater than McCloskey's estimations!

This tendency is, however, counterbalanced by a reversed pattern during the really bad harvest years, when enclosed land performed best. Yields did not decline as much as on the open fields, and comparably fewer enclosed land farmers suffered from severe crop failure. It must be noted that these findings are based on only three years of observation. These are the only bad farming years for which there is sufficient evidence on both enclosed land and open fields, and the result is repeated in all three. So how should we understand this surprising pattern?

One potential hypothesis is based on the issue of consolidation. The fact that enclosed land farmers possessed a consolidated block of land in close proximity to their houses might have improved their ability to master precarious farming situations. With the field just outside the farmyard, the farmer could follow the development of crops carefully. For the open field farmer – whose land was spread out in small parcels over large areas – potential crop failure must have been much more difficult to monitor. In the case of an extreme hurry – if, for example, the crop must be urgently collected – the enclosed land farmer had land only a few minutes' walk away. For the open field farmer however, much valuable time was lost in the transportation of tools, manpower, and animals between the farmhouses and distant fields. It could therefore be argued that farmers operating within the scattered regime in fact faced a more serious and unwieldy situation during a severe crop failure.

An alternative or, perhaps, a complementary explanation for the good performance of the enclosed regimes during the years of general harvest failure might be improvements in the farming technology. Typically, both ditching and convertible husbandry gained momentum after enclosure. These were improvements that facilitated a deeper and more thorough preparation of

the soils. And if soils were worked better, crops were also less susceptible to unfavourable growing conditions. The main effect of ditching was a lowered water table. This was of course favourable in the event of lengthy periods of rain. Ditched fields were, however, also preferable during a drought, as water on a well-drained field was less susceptible to evaporation from the upper layers of the soil. Given these circumstances, it could be argued that enclosure enabled farmers to lower the risks of agriculture.

Scattering as insurance?

We will end the empirical investigation by looking at two graphs on the distribution of yield outcomes within scattered consolidated farming regimes.

The firsts graph (Figure 6) is from McCloskey and illustrates the two cornerstones of her theory: first, risks were higher on consolidated land, and second, overall productivity was higher. Given these assumptions, scattering can be understood as a kind of insurance, where an insurance premium (the lower production) was paid in order to mitigate risk.

The second graph portrays the actual distribution of yield outcomes for the two regimes, according to the results of this investigation. The comparison is based on data for open fields and enclosed land from 1810-1846. It should be mentioned that a comparison between open fields and historical solitary farms would result in a very similar pattern. What can this graph say about McCloskey's theories?

Figure 6: "Reducing the probability of disaster by reducing variability at the cost of reduced average"
From McCloskey, *English Open fields as behaviour towards risk* (1976).

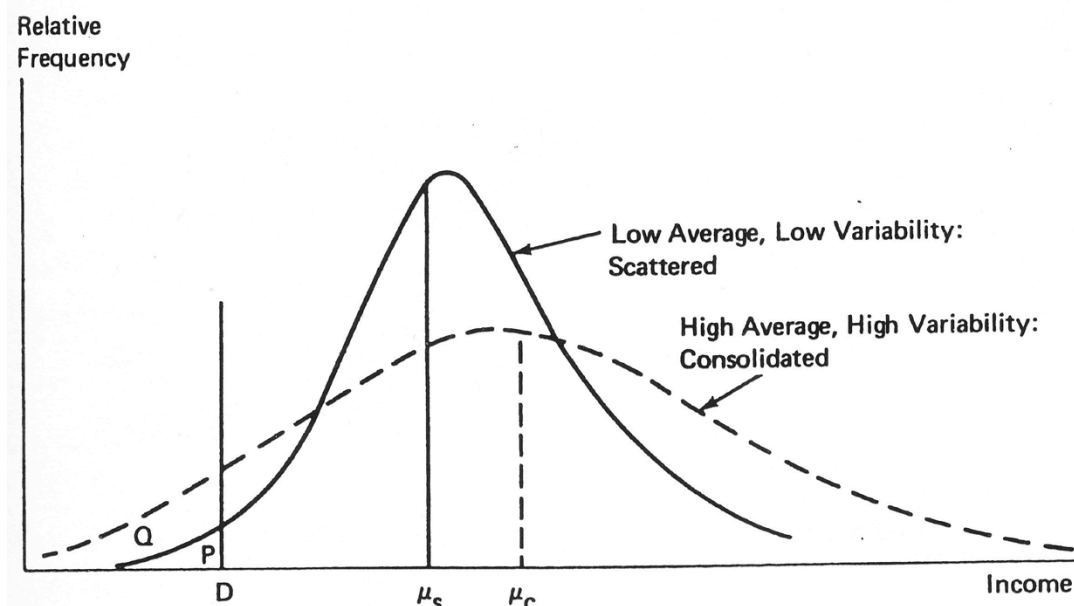
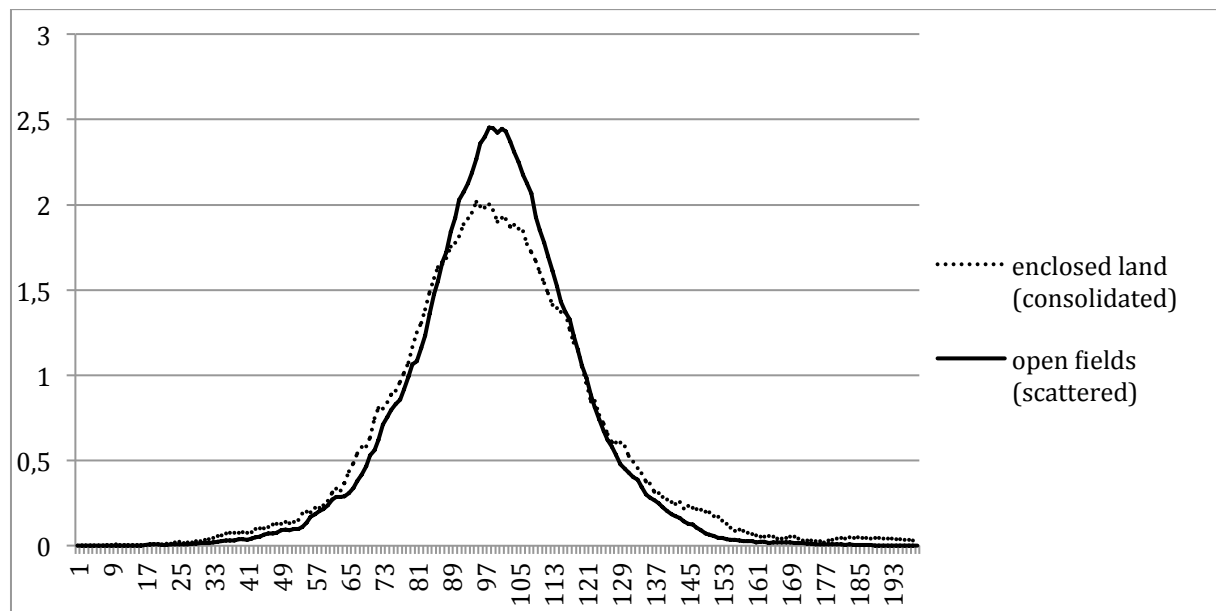


Figure 7: Relative frequencies of harvests outcomes (Y-axis) as percentage of average harvests (X-axis) on open fields and enclosed land 1810-1846. Yearly observations at farm level.



Sources and comments: Seven per cent moving averages. See further information in figure 1, 5 and table 2.

Yields on open field land did indeed vary more than yields on enclosed land, as evidenced by the fact that top of the curve is lower for the first category of land, while the base is slightly wider. These dissimilarities are, however, small.

One important difference between the two figures is that while McCloskey's is based on an assumption of higher productivity for the scattered regime, the second set of calculations makes no such assumption. Whether any of the regimes was more efficient than the other has not been an object of inquiry in this paper. What the graph does demonstrate is that *if* McCloskey's assumption of higher productivity within the consolidated regime is correct – and the curve for this category consequently should be moved rightward in the diagram – farmers on enclosed land no longer faced a higher risk of disastrous harvest compared to farmers within the scattered regime. In such a situation, scattering would be of no use as insurance. Given the empirical result of this investigation, the two cornerstones of McCloskey's theory are, in fact, incompatible.

Final discussion: why then the open fields?

Why was arable land in Medieval and early Modern Europe divided into small strips and spread over large areas within the system of open fields? One of the most influential answers to this question has been Deidre McCloskey's theory of the open fields as way to handle the idiosyncrasies of agricultural risk. The scattering of land was from this perspective first and foremost a scattering of risks. According to McCloskey, spreading risk was of crucial importance, especially during the medieval period when few other insurance institutions were available.

The theory seems plausible and has also been widely embraced by the research community, at least as a partial explanation of the system's organization. Unfortunately, the argument lacks an empiric foundation. McCloskey offered only indirect evidence, based on a short series of harvest records from the Winchester landed estates. Scattered and consolidated holding thus, were never empirically compared. "What is your evidence?" Charles Wilson asked in a critical article in 1979.³²

This article supplies the type of empirical evidence McCloskey would have needed to support her theory: long-term farm-level harvest series including observation from both scattered, open field holdings and consolidated, enclosed, or solitary farms. The analysis presented here is based the records from the collection of variable tithes in the southern Swedish province of Scania from 1715-1850, compiled in a database by the Swedish agrarian historians Patrick Svensson and Mats Olsson. In total, over 45,000 harvest entries from 37 parishes and 291 villages and solitary farms have been used in this investigation.

To some degree, the results support McCloskey's theory. There is empirical evidence that risk level on farms within the open field system was lower than on enclosed land or solitary farms, both in terms of overall variation in annual output (measured as the coefficient of variation) and with regards to the risk of severe crop failure (defined as a gross harvest of 30 percent or more under normal levels).

But it must also be noted that these differences were too small to provide any real explanatory value in the larger debate about why farmers during medieval and early modern times farmed their land in scattered plots within a system of open fields. According to McCloskey's calculations, roughly one disastrous harvest every 30 years could be avoided by scattering strips across open fields. However, according to the results of this investigation the open field organisation spared farmers one severe crop failure every 250 years compared to solitary farms, and one every 167 years compared to farmers within the enclosed regime.³³

One somewhat surprising result is that the years of general crop-failure actually affected enclosed land farmers less than farmers on the open fields (even if they suffered from more disastrous harvests during normal years). One possible explanation for this pattern is that the consolidation of arable farms and their location close to the family's dwelling enabled these farmers to take better take of their crops in situations of emergency. In addition, new farming technology introduced after the reform, such as convertible husbandry or systematic drainage of the fields, might have improved the possibilities of mastering situations like heavy rains or drought. From this perspective, this article has argued that enclosure might have been a way to *lower* risks within agriculture.

This investigation and its results could, conceivably, prompt several objections: How can we know for sure that the tithe records reflect actual yields, rather than the outcomes of a game of negotiations between the vicar and the peasants? Although a statistical analysis of the material supports its reliability, we can never be certain that every entry is correct. Given the fact that production on enclosed land was relatively easier to control than production in open fields, it is

³² Wilson 1979: 199.

³³ Calculated from McCloskey 1976: 132, table 1; this paper table 2.

more likely that the sources underestimate the variation in actual harvest outcome in the latter case than in the former.

A somewhat trickier question is to which extent the comparison with enclosed land during the first half of the 19th century is relevant in connection to the discussion of medieval or early modern farming. McCloskey's main focus was on 14th century England. For farmers of these times, enclosure was simply not an available option (even if her writings seem to imply that this was the case). They had probably never heard of convertible husbandry or systematic table water drainage, among other methods – technologies that, as mentioned, might have contributed to the enclosed regime's comparably successful management of risk.

From this perspective, the comparison between open fields and solitary farms is strategic. The solitary farms in the forest region were an integrated part of traditional agriculture. They offer an opportunity to analyse consolidated farming on land that had not passed through the modernising enclosure process. The fact that levels of risk were only slightly higher on the solitary farms than on the open fields indicate that scattering cannot have reduced risk to the extent suggested by McCloskey.

Also important in this context are the results from the farming regime of “*reformed open fields*”, ie open fields that had passed through the 18th and early 19th century *storskifte* land reform. The main outcome of this reform was a drastic reduction in the number of strips belonging to each farm. A comparison between the reformed and the non-reformed open fields should indicate whether the often extremely high levels of scattering within the traditional farming regime really could be driven by the need for risk reduction.

This does not seem to have been the case. Risk levels, measured as coefficients of variation, were only *slightly* lower on non-reformed versus reformed open fields. It could thereby be argued that farmers on the traditional open fields paid a high price in terms of scattering for rather modest risk reduction. At the same time, it should be noted that during the first half of the 19th century, the reformed open field was the category of land facing the highest probability of severe crop failure. Explanations for this pattern might, first, include the fact that farmers of this land category were somewhat more exposed to variations in yields due to the lesser degree of scattering and, second, had not adopted new risk-reducing farming technology to the same extent as enclosed land farmers.

To sum up, it is clear that McCloskey's theory has largely failed the empirical test. The scattering of risk does not seem to hold water as an explanation for the scattering of land. Why not?

The main answer is probably rather simple: Risks in agriculture have more to do with inter-year variations at the regional level than with inter-strip variation at the level of the field. In the end, the hailstorms that destroy all crops within a hundred metres range but leave untouched the crops just beyond that boundary, are rare phenomena. The major crop failure that left most farmers with a drastically reduced harvest, was a much more realistic scenario. Or as Charles Wilson put it in his 1979-article:

Peasants of yesterday, like farmers today.... thought in terms of a 'good' year and a 'bad' year. By and large, I suspect disaster struck areas much larger than an acre – or even thirty acres.³⁴

³⁴ Wilsson 1979: 195

Inevitably, however, such a conclusion leads to the next question: Why then the scattering? Why then the open fields?

In the classical debate of the 1970s and 1980s, Fenoaltea and Dahlman offered two alternate explanations. Fenoaltea, just as McCloskey, saw the scattering of land as the heart of the open field system. By holding small pieces of land all over the village, Fenoaltea argued, peasants could concentrate their efforts on that specific spot that, given the shifting advance of the farming year, most desperately needed to be ploughed, seeded, or harvested. The open field system's primary aim was to facilitate an efficient organisation of fieldwork across the space-time dimension. In contrast Dahlman, identified the possibilities of large-scale grazing as the core of the open fields.

Cull, Hoffman & Hughson who, in 1992, contested McCloskey's theory on the base of tithe records at the parcel level from northern France, tended to lean towards Fenoaltea's theory in their final discussion.³⁵ In our view, however, the result of their as well as our analysis points in another direction. Both McCloskey's and Fenoaltea's theories rest on the idea of the shifting local natural conditions as the basic preconditions for the open field system. In this context, it could be argued that the insight that yields did not vary that much from one plot of land to another casts doubts on whether the plots differed that much in other aspects – for example, with regards to the pace of the farming year's advance.

Certainly, there were important differences between sunny slopes facing south and foggy valley marshes. Less certain, however, is whether these differences warranted the division of each and every field into five, ten, or even twenty strips for every farmer. In practice, large parts of the European open field system covered plainlands, with minimal differences in, for example, altitude, soils, or microclimate between village domains. Neither McCloskey's nor Fenoaltea's theory satisfactorily explains the fact that fields in such uniform regions were commonly divided up into a large number of scattered parcels (see for example Map 5, page 26; and Photo 1, page 28).

In this context, the general lack of empirical evidence within the 1970s-1980s open field debate becomes evident. To substantiate the assumption that the scattering of land corresponded to a mosaic of shifting growing conditions, McCloskey and Fenoaltea might have used a few typical villages as examples and analysed their geography. Are the borders between fields and strips laid out so that every part-owner is guaranteed land with different soil qualities, level of sun exposure or humidity, and so on? The authors make no such attempt.³⁶

Of the three classical theories on the open fields, we are thereby left with Dahlman – who in contrast to the other two contributors does not use scattering as the starting point for his analysis. When it comes to empirical work, his analysis is not better grounded than the work of the other two researchers. Still, at least with regards to Scania and Sweden in the 18-19th centuries, his theory definitely makes more sense. The economy of common grazing was without doubt an essential component of the system.

Highly important in this context was the fact that open and common fields cut fencing costs. In most Swedish plainland regions, crop rotation was integrated across neighbouring villages, so that the borders between adjacent strips could be left unfenced (see for example Map 3, page 24). These systems often covered tens of miles. In the forested areas, pastures in the commons were

³⁵ Cull, Hoffman & Hughson 1992: 17.

³⁶ Fenoaltea's research is based solely on literature. Out of his 46 pages 1988-article he uses only four (190-193) to put forward his own explanation.

organised similarly (see for example Map 4, page 25).³⁷ If, instead, each individual village or farm had to fence off their own lands, costs would have been untenable. The open and common field systems were, from this point of view, a basic precondition for the viability of Medieval and Early Modern farming. Whether a high level of land scattering within those fields was a necessary or desirable component of the system must be regarded as less certain.

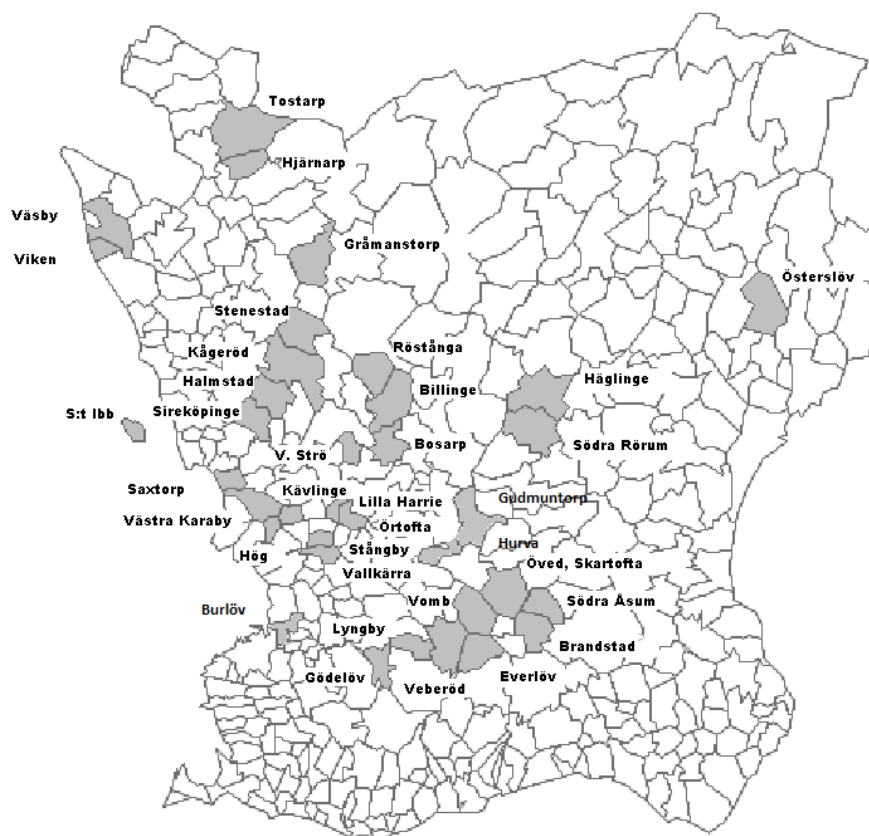
Interestingly, this conclusion corresponds quite well with the enactment of the 19th century Swedish *storskifte* land reform. Even at this stage, the state's ambition was breaking up the open and common fields and privatising land. From 1783 onwards, legislation explicitly favoured this solution. However, few landowners at this point opted for such a drastic reform. In the end, open field organisation, including common grazing, common fences, and common crop rotations were generally maintained. The main result of the reform was instead, as previously discussed, the drastic reduction of scattering within the open fields. This outcome probably corresponded quite well with the needs of farmers of the period. Only with the 19th century advancement of a new farming regime, based on convertible husbandry, ditching, and new crops such as clover and potatoes did common grazing and crop rotation become obsolete.

What is still left to explain is why the level of scattering was so high in the first place. Regarding this question I think we are forced to humbly admit that it is not possible to reach a well-grounded answer given the evidence at hand. In the early 18th century, which is as far back in time as the database of Scanian tithes reaches, the open field system, with its scattered pieces of land, had already been in place for several centuries. For farmers of this time, the system was simply a reality. Up until the adoption of the state-initiated land reforms, farmers had no real ability to alter this organization – whether they liked the high degree of scattering or not. From this perspective, the starting point for a discussion the scattered nature of the open fields must focus on how the system came into being. In this context, it is important to deal with research questions that address the social mechanisms of land reclamations, the practices regarding inheritance of land, and the methods and techniques used in the partition of land prior to the period when a modern system of land surveying was at place. This would require a return to the research questions prior to the debate of the 1970-80s.

³⁷ Hansen 1952; Nyström & Hallberg 2017; Karsvall ??; Hallberg 2013.

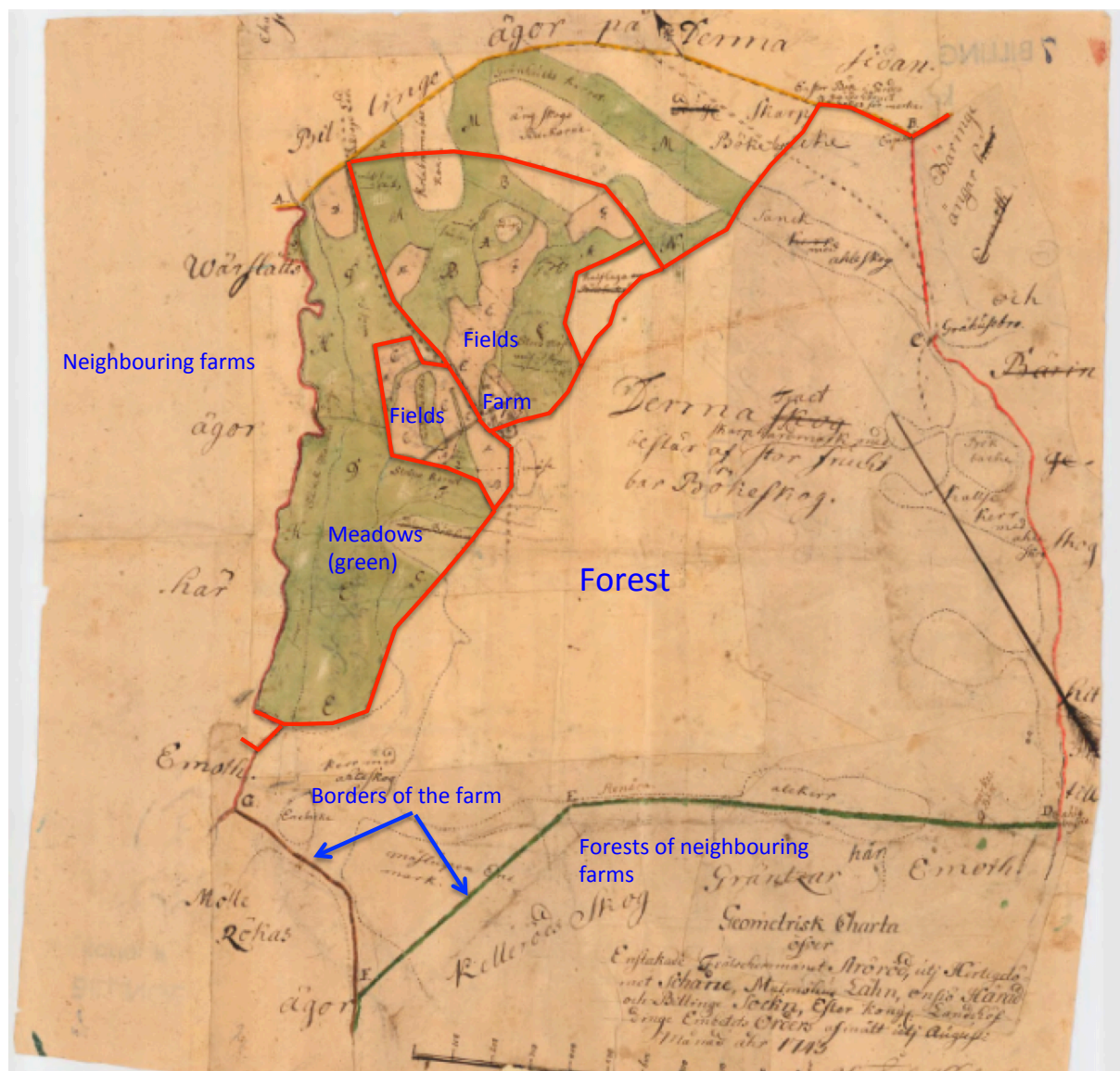


Map 1: The location of Scania



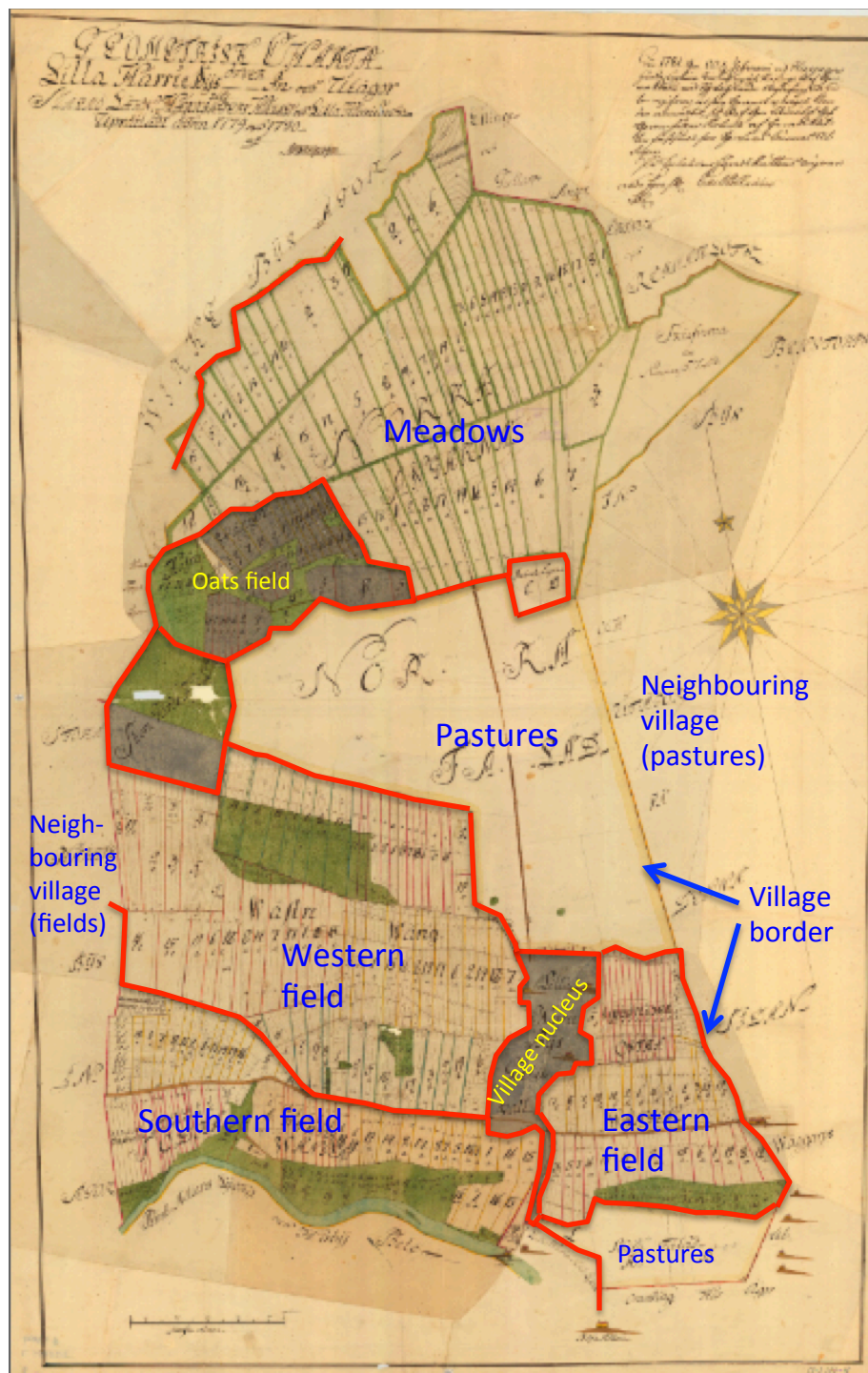
Map 2: The 37 parishes in the Historical Database of Scanian Agriculture

(From Olsson & Svensson 2017, p. 9)



Map 3: Ströröd solitary farm in 1744 (fences marked in red)

Source: Lantmäteriet (The Swedish Mapping, Cadastral, and Land Register Authority) historiska kartor (<https://etjanster.lantmateriet.se/historiskakartor>). Archive of Lantmäterimyndigheterna; Billinge parish, Malmöhus province, Ågobeskrivning, 1744 (12-BIN-7).



Map 4: Storskifte reform map of Lilla Harrie village, 1780 (fences in red)

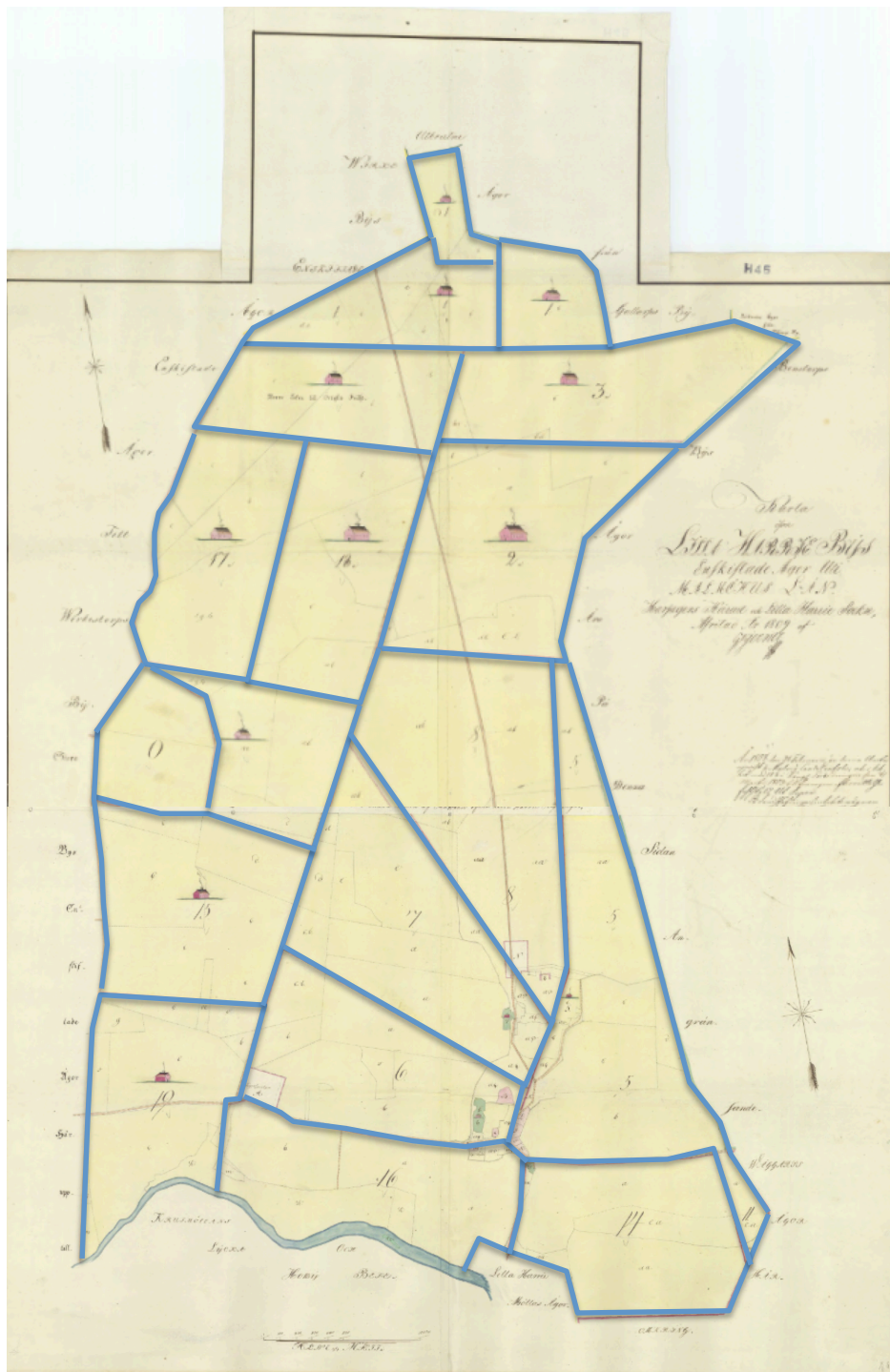
Source: Archive of Lantmäterimyndigheterna, Lilla Harrie parish, Malmöhus province: Storskifte, 1780 (12-LIH-4). See map 3 for further details.



Map 5: Storskifte reform map of Lilla Harrie village, 1780: Detail from the Western field

Comment: coloured lines and large numbers indicate the distribution of strips after the storskifte reform. Fine black lines and small numbers indicate the previous distribution of the land.

Sources: see map 4.



Map 6: Enskifte reform map of Lilla Harrie village, 1809: The new distribution of land.

Source: Archive of Lantmäteristyrelsen, Lilla Harrie parish, Malmöhus province, Enskifte, 1809. See map 3 for further details.



Photo 1: The present-day landscape at Lilla Harrie.

Comment: The landscape pictured is roughly the same as in Map 5 (page 26). The road next to the houses in the lower part of the photo corresponds with the old road that ran parallel to the division between the southern and western fields prior to enclosure (at the bottom of Map 5). Could differences in the natural endowments really explain the scattering of land in small strips divided between local farmers during the open-field regime?

Photo by courtesy of Per Pixel.

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