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MATS WIDGREN

Settlement and farming systems in the early Iron Age

A study of fossil agrarian landscapes in Östergötland, Sweden
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Settlement and farming systems in the early Iron Age

A study of fossil agrarian landscapes in Östergötland, Sweden

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The following methods are used in the study: field surveys, mappings, excavations, analyses of 17th- and 18th-century maps, pollen analysis and computer simulation.

The results show that stone-wall complexes were established in the first few centuries A.D. Settlement then consisted of single farmsteads united by a common, stone-wall system to form large complexes. The intensively cultivated arable formed a minor part of the enclosed lands, which were mainly used for haymaking. The establishment of this infield system was connected with a marked increase in human influence on the vegetation, but the farming system also set some very definite limits to further increase above a certain point. In the period A.D. 400 to 700, the agrarian production declined, the stone-wall complexes were split up and the historically known, hamlet territories were shaped. This division of the land lies incongruously over the old, land-use pattern and implies a radical restructuring, which laid the foundation for the historically known landscape in the area.
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After my own field work was completed, a survey of the ancient monuments in the area was carried out by the Central Office of National Antiquities. Björn Winberg placed the results at my disposal at an early stage.

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The drawings were made by Elizabeth Hedlund. Neil Tomkinson, B.A., revised the English and Carl-Jonnie Listerby assisted with the publication.
In the initial stage of this work, I drew on two sources of inspiration. The choice of subject was inspired by the investigations at the abandoned settlement of Halleby in the county of Östergötland, Sweden (Lindquist 1968, Baudou 1973). In the archaeological publication, Evert Baudou was critical of the work of his geographical co-worker on the same project. On the question of the age of the main boundaries in particular, Baudou’s conclusions differed sharply from those of Lindquist. This divergence of opinion was a stimulus to further studies. I also had experience of the same source material (Klang & Widgren 1973).

The choice of approach in the work was inspired by the previous works of the historical geographers in Stockholm (mainly Helmfrid 1962, Lindquist 1968 and Sporrong 1971), but also to a very large extent by the summaries of pollen-analytical, archaeological and geographical studies of the agrarian landscape published by Berglund (1969) and Welinder (1974, 1975). Berglund systematised the evidence of prehistoric landscape changes and showed distinct and synchronous periods of expansion and stagnation in the southern-Scandinavian landscape.

Welinder explained the expansions by analysing the farming techniques associated with each phase. He saw periods of increased human influence on the landscape as the result of the appearance and diffusion of agricultural innovations, leading to an intensification of agriculture.

These works added a long-term perspective to the development models previously presented by the geographers (Lindquist 1968:47–49, Sporrong 1971:197–198). At the same time, Lindquist published his work on Gotland, where he explained the early-Iron-Age, agrarian development in terms of technological and social change (1974). In contrast to previous works on the development of prehistoric settlement in Scandinavia, these works focused attention on the internal development of the agrarian society and made it possible to discuss the settlement changes in terms of ecology and farming systems.

One of the most important steps in this development is the establishment of a fixed boundary between inägor (infield land, including enclosed meadows) and utmark (unenclosed, outlying land). This boundary has a fundamental significance for the subsequent development of the agrarian landscape.

The transition from soil improvement by clearance (röjningsgödsling) to farmyard manuring is intimately related to the establishment of these boundaries, even though the improvement by clearing continues to play a role up to the time of modern farming on both enclosed and outlying lands. The establishment of this land-use contrast is also important for the development of rights of possession. As a corollary to the appearance of individual rights of use of the enclosed lands, the property rights to land are gradually emerging.

Lindquist’s dating of these boundaries to c. 100 A.D. in Östergötland was questioned by Baudou. The first source of inspiration—the Lindquist-Baudou disagreement—thus left me with the main chronological question in the present work: when was the boundary between inägor and utmark established?

The second source of inspiration left me with the following functional questions. What type of farming system do the abandoned settlements and fields in Östergötland represent? Can the subsequent abandonment of the settlement be understood on the basis of an internal development of the farming system, rather than as having been caused by the various external factors discussed by many previous students of the problem (see below)?
1.1 Agrarian development in Scandinavia during the Iron Age

1.1.1 The nature of the evidence

The pollen-analytical evidence points to two distinct periods of expansion and increased human influence on the Scandinavian landscape during the Iron Age (for the chronology of the Scandinavian prehistory, see Fig. 1:1). The early-Iron-Age expansion covers roughly the period 200 B.C. to A.D. 450 and the late-Iron-Age expansion the period A.D. 800–1100 (Berglund 1969:23 f.).

Of these two periods, the first has left abundant evidence in the form of fossil agrarian landscapes with house foundations, stone walls and lynchets, while the second can only be approached indirectly by retrospective analysis of the oldest maps and the fragmentary, mediaeval, written sources.

The early-Iron-Age evidence is thus plentiful, but it is concentrated in some rather limited areas: the Baltic islands of Öland, Gotland and Bornholm, the provinces of Östergötland and (to a certain degree) Uppland in Sweden, the provinces of Rogaland and Vestagder in south-western Norway, and Jutland in Denmark (see the references in subsection 1.1.2 and Müller-Wille 1965).

In other areas, house foundations dating from the early Iron Age are abundant, but the evidence of fields and enclosures is still scanty, as in Nordland and Troms in Norway (Johansen 1979) and in Medelpad and Hälsingland in Sweden (Selinge 1977:327 ff., Liedgren 1981).

There may have been many reasons for the concentration of this type of evidence in some areas:

(1) It is possible that these areas were economic and administrative centra and therefore saw greater settlement and population expansions than other Scandinavian areas (cf. Myhre 1978). However, pollen diagrams from other areas witness to a similar development also where traces in the field are fewer (Berglund 1966:167, Welinder 1974:93).

(2) A trait common to all these areas is the fact that the landscape type offers many different alternatives for settlement location. The changed, locational preferences over time, caused by technological, social or climatological changes, are more easily manifested in such landscapes. In many other Scandinavian areas, the possibility of agrarian settlement is constrained by narrow valleys or other terrain formations which, in a more consistent and sustained way, have conditioned the settlement location in all periods. The greater part of the prehistoric landscape has thus been destroyed by later developments. Prehistoric sites may have been re-occupied during the mediaeval period but were finally destroyed during and after the enclosure movements in the 19th century.

(3) Furthermore, in all areas with large occurrences of prehistoric, fossil, agrarian landscapes, there are also extensive grasslands, which have been used as pasture or hay meadows during historical times and up to the present day. In such areas, the possibilities of fossil forms being preserved and observed are therefore good.

To sum up, the abundant occurrence of fossil forms dating from the early Iron Age in some areas may thus be dependent on three factors:

(1) A stronger expansion during the early Iron Age,

(2) A larger number of alternatives for settlement location, and

(3) A physical landscape which has subsequently discouraged the emergence of a totally cultivated, arable landscape.
1.1.2 Period of expansion, 200 B.C. to A.D. 400

Since the investigations at Halleby were published, research in some of the other areas has developed markedly. The following survey is based mainly on results from Gotland, Öland and south-western Norway. The previous research in Östergötland is treated in section 1.2.

The early-Iron Age period of expansion is characterised by an intensification of arable farming and an increased permanency of the arable land. In large parts of Europe, this period began in the late Bronze Age, with the establishment of what are called "Celtic" fields. The forms of tillage established in these fields may have differed from those of the farming systems established later in this period, but in a long-term perspective the introduction of the "Celtic" fields must be considered to have represented an intensification of farming and the beginning of a more fixed land-use. The connection between the expansion period—interpreted from pollen diagrams—and the establishment of the "Celtic" fields has been described by Bradley (1978a:276).

The "Celtic" field systems, which can be found in large parts of north-western Europe, were usually abandoned during the 2nd and 3rd centuries A.D. (Bradley 1978a:275, Brongers 1976:74). In many parts of Europe, there is a lack of source material concerning the immediately subsequent, field systems.

In Scandinavia, Gotland is a key area in this context. The large, "Celtic", field systems are there antecedent to the stone walls and house foundations dating from the following centuries (Lindquist 1974, Carlsson 1979, Windelhed 1980 and forthcoming). The shift from the large field systems to the following phase—characterised by small areas of arable land and by enclosed infields and cattle paths—were interpreted by Lindquist and Carlsson as an intensification of farming. According to these arguments, during the earlier phase, the balance of nutrients in the arable land was based on a form of bush fallow system, while the later phase represented an intensive use of manured fields and an integration of arable farming and cattle-breeding within the same farming system.

The shift may have been caused by population pressure and, according to Lindquist, the "Celtic" field system present up to A.D. 200 indicates that settlement and social relations were organised in some form of large society, perhaps with a division of functions within the social group (farmers, herdsmen, craftsmen, etc.) (Lindquist 1974:31).

The later farm structure (A.D. 200-500), on the other hand, was probably based on "the family or the extended family as the social basic unit" (Lindquist, op.cit.).

The very large house foundations, which characterise Öland, Gotland and south-western Norway during this second period (Stenberger 1933, 1955; Petersen 1933, 1936), led to conclusions that the basic unit on the farms must have been an extended family of 20–30 individuals (Hagen 1953:157). The period of decline during the 5th and 6th centuries has also been discussed as an effect of the dissolution of the extended family (Rønneseth 1974:50). A functional analysis of the floor space in the house foundations by Myhre has, however, shown that only small parts were used as living space. Myhre gives no figures but considers that there were probably fewer people and fewer animals on the farms than has earlier been thought (Myhre 1980:326).

Such farms—with stone walls delimiting an infield area—were established in all the discussed areas during the period A.D. 100 to A.D. 300. As Myhre writes (1978), no dates earlier than A.D. 100 can be established for this type of farming structure either in Norway or in Sweden.

The agrarian development in the different areas shows many common traits. The expansion between A.D. 100 and A.D. 400 had the character of an inner colonisation, and led to the splitting up of previously larger territories (cf. Myhre 1978:249, Carlsson 1979:85). The deserted farms dating from this period suggest that the numbers of farms on Öland and Gotland and at Jæren in south-western Norway the were comparable to the numbers in historical times. On Öland, "the major part of the land now cultivated was also used during the Iron Age" (Näsman 1978:351). At Jæren, the farms were so densely located that each farm had at its disposal an area of only 1–2 km² (Myhre 1978:248). In the central parts of Jæren, one may even reckon that the number of farms exceeded that in historical times (Rønneseth 1974:63, Møllerop 1957:22). Carlsson reckons with a number of farms on Gotland which is almost as high as the 18th-century figure (Carlsson 1979:146).

Since the central areas were fully colonised, an expansion to marginal areas has also been documented. This has perhaps been demonstrated most clearly in south-western Norway, where the establishment of heigårder and fjellgårder has been interpreted as reflecting population pressure from the central areas. The abandoned farms in the marginal, upland areas acted as a "pressure valve" during periods of population growth (Myhre 1972:164, Rønneseth 1974:64). These farms were among the latest settled and were probably among the first to be abandoned during the decline. The marginal farms of Gotland have been interpreted in
the same way (Carlsson 1979:121). On the thin, weathered soils of the Stora Alvaret on Öland, a settlement was also established during this period (Enckell et al. 1979).

The period 200 B.C. to A.D. 400 was thus characterised by a distinct expansion of settlement. In some central areas, the density of settlement approached the figures in historical times. The settlement expansion also reached marginal areas.

### 1.1.3 Development during the regression period, A.D. 400—700

During the following centuries, many of the settlements were abandoned and the pollen diagrams also bear witness to a decreased human influence on the landscape. The discussion of the forces behind this regression can be summarised in the questions: Break or continuity? Inherent or external causes? Ecological or social factors?

**Break or continuity?**

The deserted farms dating from this period have traditionally been regarded as the most clear-cut examples of a break in settlement continuity in prehistoric Scandinavia. The view which Stenberger put forward in the Vallhagar publication has here played a great role. He wrote that “few areas show so sharp a break in continuity of prehistoric settlements as Öland and Gotland” and interpreted the evidence of the many deserted farmsteads as “an almost universal end to occupation” (Stenberger 1955:1168).

The element of discontinuity in the landscape during this period was stressed because the clearest examples of discontinuity—the deserted farm houses—were the main object of study at that time.

In new approaches to the continuity problem, this view has been seriously questioned. The demands for clear definitions of the terms place continuity, settlement-area continuity and regional population continuity have led to changes in the scale of the assumed break of continuity (cf. the discussions in Thrane (ed), *Kontinuitet og bebyggelse* 1977). In a way, one could say that the burden of proof has been shifted from those who advocate continuity to those who advocate a break in continuity in a specific area.

Alternative explanations of the abandonment of the farmhouses have also been proposed and the actual evidence for their dramatic desertion has been scrutinized. Edgren has examined the documentation on the eight farmhouses excavated by Stenberger on Öland. A desertion in connection with a fire, which may support the idea of a catastrophic and sudden desertion caused by war, has only been proved in one case (Edgren 1979).

In a summary of the research on Öland, Näsman shows that the very sudden period of change which earlier discussions were based on cannot be proved from the archaeological records. In his analysis of the find statistics, hoards of solidi, fortifications, settlement patterns and climatic conditions, he reaches the conclusion that many periods of unrest, including wars, may have occurred, both before and after the end of the 5th century, but he sees in the period also an impoverishment of the soil and a change in the climate (Näsman 1978).

Three groups of house foundations on Öland investigated by Beskow-Sjöberg were deserted as late as the 6th to 8th centuries A.D. and the excavator concludes: "There must have been some sort of disturbance—the gold hoards suggest this—and the grave finds show that population became fewer and poorer, but I prefer to think that parts of the kämpagravsbystad continued for many centuries, as did the farms in the Skedemosse region" (Beskow-Sjöberg 1977:129).

Carlsson estimates that between 15 and 20 per cent of the farms on Gotland were actually deserted and maintains that most of the farms survived the critical period. He has also shown how a seemingly typical, deserted farm dating from the early Iron Age has a direct continuation in a Viking-Age farm within the same settlement area (Carlsson 1979:138, 146).

Rønneseth considers that the deserted houses can be explained as being due to a shift within the settlement areas:


Also Myhre considers that this abandonment of houses may have occurred without a drastic reduction of the population and regards it as possible that it was a result of changes of farm structure, farming technique and settlement pattern (Myhre 1980:96).

Not only differences in the scale of continuity, but also differences in the aspects investigated have characterised the Swedish debate. Carlsson's analysis, based on comparisons of 18th-century maps and the distribution of house foundations and stone walls dating from the 6th century or earlier (Carlsson 1977), supports the possibility of a structural continuity in which the basic units of farms have been constant over time, but from this evidence no conclusions can be drawn about settlement continuity within the area. The farms and their lands may have lain waste for varying spans of time and later been resettled in more or less the same forms. A third aspect of continuity is the evidence gathered from the vegetational development. In the discussions of settlement continuity, pollen diagrams have been
widely used. They give descriptions of changes in human exploitation of the landscape. The changes in the agrarian production to which the pollen diagrams bear witness cannot, however, be equated with changes in settlement and population. The aspect of continuity described by the pollen diagrams can be called production continuity (cf. Widgren 1981).

**Inherent or external causes?**

As explanatory factors of the decline, much of the previous research has mainly emphasised external causes, such as war, migrations, climatological changes and a breakdown of the trade routes with the Continent (Stenberger 1955, Hagberg 1967). The climatological factors have been connected with pedological and ecological variables, but it has not been shown that these factors can explain the changes, except in marginal areas. In the discussion concerning this period of decline, epidemics coming from the Continent and a lack of salt which would have occurred as a result of the decline in trade have also been suggested as contributory factors (Gräsland 1973).

An analysis in terms of energy systems of the dependence of Öland on relations with the Roman Empire has been published by Enckell et al. (1979). In the discussion of the causes of the decline, this paper is mainly based on the explanations previously proposed by Hagberg.

On the other hand, Renfrew has shown how sudden changes and discontinuities in culture systems and settlement patterns may be explained by inherent factors in the system rather than by external ones, thus shifting the focus to the local development (Renfrew 1978a, 1978b).

The most coherent description of the expansions and stagnations in the Scandinavian agrarian landscape, based on its internal development, has been developed in the previously mentioned works by Welinder (1974, 1975). He concentrates his attention on the forms of circulation of energy and nutrients in the different farming systems and describes the specific set of implements and farming techniques which lies behind each expansion period.

In a simplified model, he discusses four variables, which may explain the long-term development of the agrarian landscape between 4000 B.C. and A.D. 1000: (1) food production, (2) population growth, (3) agricultural innovations, and (4) ecological limitations. "The interactions between variables 2 and 3, the population growth and the agricultural
innovations, generate the expansions and the stagnations in the food production, variable 1" (Welinder 1975:91).

The main innovation stages in agriculture are here seen as being due to the population reaching the ecological limit (Fig. 1:2). The ecological limits, as defined by Welinder, are seen as the natural pre-requisites for cultivation. By introducing new agrarian techniques, man can raise these limits and increase the production of food.

During the expansion period in the early Iron Age, the main innovation was the introduction of farmyard manuring and of a farming system with fixed boundaries between different types of land use. The "locked" structure of the landscape which was then developed is regarded by Welinder as the cause of its subsequent ruin (Welinder 1974:254).

As regards population growth and agricultural change, Welinder's model is based on a work by Boserup (1973). Serious objections can be raised against her view of population change as an independent variable (cf. Welinder 1975:60; for an overview of the discussion, see Grigg 1979 and for a discussion of Welinder's use of Boserup, see Myrdal 1978). Because of the problems connected with the population data, this component in the model can hardly be tested on prehistoric periods.

In a later work, Welinder discusses the advantages and shortcomings of the model. He maintains that, in a long-term perspective, the demographic variable may be expressed as a steadily increasing population but that, in short-term perspectives, such an approximation will be too coarse. In a short-term perspective, the role of the social structure must also be included in the analysis (Welinder 1977:21 ff.).

Nevertheless, in spite of its simplicity—or perhaps because of its simplicity—the model accounts for many of the basic characteristics of the prehistoric, agrarian development. It has proved fruitful for the systematising of our knowledge of the development of settlement and farming systems during the Iron Age (cf., for example, Myhre 1978).

One important consequence of the model is that signs of crisis cannot be interpreted as over-exploitation in an absolute sense but must be related to a certain farming system. The verification of the model in the case of the early-Iron-Age expansion and the subsequent decline presupposes two conditions:

1) That the landscape in all parts of Scandinavia affected by this decline was already fully occupied during the 4th and 5th centuries A.D. and that further expansion by the establishment of new agrarian units was no longer possible. The supposed population pressure must then have led to a set of new agrarian innovations.

2) The second condition is that a set of agrarian innovations can be dated to the early part of the late Iron Age (c. A.D. 600–700), which can be seen as a response to the increased demand for food. Welinder here discusses the increased use of iron tools, strip-parcelling and the introduction of two-course rotation.

Ecological factors or socio-economic factors?

Welinder's main approach in these works is ecological and technological, and he has also been accused of being a mechanical materialist (Bertilsson 1978). A contrasting approach in explaining the early-Iron-Age expansion has been formulated by Knut Odner. In his work on economic structures in western Norway (1972), he has shown how "social relationships can be looked upon as an economic force which determines production" (Odner 1974:152). The settlement expansion and the use of widely spread resources during this period are regarded as having been caused by a redistributive economy based on "the capacity of chieftain organisations to raise the level of production" (1974:152). The signs of decreased agrarian production and regression of settlement during the middle of the first millennium can then be seen as having been due to the collapse of the chieftain organisation and the establishment of a bureaucracy and a market economy (see the overview by Moberg 1974).

The analysis of the relations between settlement structure and social development in south-western Norway has been further developed by Myhre (1978,1981).

To my knowledge, there are no studies on the early-Iron-Age, social organisation in central Sweden based on the approach of Odner. Some of the archaeological features of western Norway which are the basis of Odner's work (1972:638) are applicable to eastern central Sweden, while others are not. The starting-point for his analysis is the evidence of a permanent habitation in rock shelters and caves along the coast during the early Iron Age. The environmental characteristics of south-western Norway, with its rich and varied set of ecological niches and with its opportunities for fishing, hunting and gathering, form an important basis of the model.

The Odner model thus cannot directly be applied to eastern central Sweden. A comparative study would require an analysis, not only of the settlement structure, but also of the other archaeological material on which the model is based. But Odner's basic conclusion—that social organisation under certain conditions may have a determining influence on the level of production—has a general applicability to studies in settlement and landscape changes. It shows that changes in population, in agrarian technology and in farming systems can never alone
account for the dynamics of the agrarian landscape.

1.1.4 Expansion during the period A.D. 700–1200

In the whole of Scandinavia, the late Iron Age is characterised by a renewed expansion in the agrarian landscape. The lands which were abandoned or only extensively used during the decline were gradually taken into use again. The actual shape of the agrarian landscape during this period is only scantily known, but numerous changes occurred as between the early-Iron-Age landscape and that known from 17th- and 18th-century maps. In eastern central Sweden the most important changes can be said to be the introduction of a field layout adjusted to a two-course rotation (tvåsäde) and the concentration of the settlement into hamlets or small villages (Sw. by, plur. byar). Connected with this process is also the regulation of settlements and lands according to the solskifte.

A relative chronology of this gradual integration of single farms into regulated byar has been developed by Helmfrid (1962:119, 168 ff., 231 ff.), Lindquist (1968:122 f.; cf. Fig. 1:3 in this work) and Hannerberg (1977:139 ff.). A model of the forces behind this process has been presented by Sporrong (1976). According to Lindquist, Hannerberg and Sporrong the concentration of settlements occurred during the late Iron Age. On the other hand, the existence of byar in these areas during the late Iron Age has been questioned by Ambrosiani, who considers, on the basis of archaeological evidence, that each later by territory in the eastern part of the Mälar Valley area only contained one single farm (Ambrosiani 1964:202 ff.).

A problem in relation to the model proposed by Welinder is that only a few of the agrarian innovations which occurred during this rather long time-span can be dated definitely. While the earliest, actual datings of a field layout adjusted to a two-course rotation all point to the 11th century A.D. or the 10th at the very earliest (Sporrong 1971:197, Lindquist 1975, U. Göranson 1977), many authors treat the two-field system as one of the explanatory factors behind the agrarian expansion during the period A.D. 600–1000 (Sporrong 1971:197, Welinder 1975:84, U. Göranson 1977:157, Carlsson 1979:40, 147).

In the case of eastern central Sweden, the expansion period in the landscape thus started as early as the 8th century A.D., while the earliest evidence of the new farming system can be dated only some 200 years later. With the datings available at present, it is thus unreasonable to regard this agrarian expansion as having been primarily caused by the introduction of a new farming system.

The problem is the same in the previously treated areas in south-western Norway. In the historical landscape, the arable land is concentrated in a small, intensively manured area, with high lynchets (gamleåkern). The infield area is expanded to include large areas of meadow land. But this change has not yet been dated and one author has proposed a third form of farming system with widely extended, but extensively used, arable land during the late Iron Age (Rønneseth 1974:101 ff.).

While changes in field layout and farming system can thus be securely be dated only to a late part of the expansion period, it seems that the introduction of new agricultural implements (cf. Welinder 1975:81,84) can to a greater extent be connected with the initial stage of the expansion period. A recent survey shows that, around A.D. 500, three important changes occurred in the use of iron tools in Sweden: (1) a new type of sickle, more convenient for reaping cereals, came into use, (2) a scythe with a longer blade was developed, and (3) the iron ard-share was introduced (Myrdal 1982).

During this period, the sources also permit us to draw more definite conclusions as to the role played by the social and territorial organisation in the settlement development. Hannerberg has showed in a number of works how administrative divisions and methods of taxation led to a very developed and conscious planning of the agrarian landscape already during the late Iron Age (summarised in his work published in 1977; cf. also Hannerberg 1976). The influence of the administrative divisions has also been treated by Sporrong (1971) and Hyenstrand (1974).

There is also reason to believe that changed forms of landholding influenced the development of the agrarian landscape during this period. Many of the rune-stones served not only as memorials to the deceased but also as documents of inheritance (Jansson 1976:97). The inscriptions witness to the same forms of inheritance of land in the 9th century as in the mediaeval laws (Carlquist 1977). Furthermore Randsborg has analysed a number of inscriptions from Skåne and Denmark which points to the emergence of a class of people whose rights to land—as servants to the king—differed from the traditional forms of landholding (Randsborg 1980:25 ff.).
1.2 Previous research in eastern Östergötland

1.2.1 1920 to 1960

The field evidence of Iron-Age agriculture in the eastern part of the province of Östergötland is as extensive as the corresponding material on Öland and Gotland, though less well known and studied. The remains of buildings dating from the early Iron Age on the Swedish mainland are usually consistent and marked only by a slight terracing. This—in combination with the often very strange way in which the stone walls run—has hampered research, and the function of these stone walls did not become clear until the sixties.

During the 1920's and 1930's, Colonel N. D. Edlund strongly defended the view that most of the fossilised stone walls had been the foundations of an extensive network of wooden palisades built to defend Östergötland from invading enemies. The results of his very careful records were presented in a local newspaper under the heading of Våra östgötska förfäders värn mot fienden (The defence of our Östergötland ancestors against the enemy) (Edlund 1926). Until the 1979–80 inventory of ancient monuments carried out by the Central Office of National Antiquities (Riksantikvarieämbetet) in the area, the Edlund records (kept at the A.T.A.) were the only records of stone walls that covered large parts of the province.

Edlund's interpretation of the function of the stone walls was, however, opposed by Arthur Nordén, who had carried out some archaeological investigations of stone walls. On the basis of some excavations which showed connections between graves and stone walls, he interpreted the stone walls mainly as reflecting cultic factors (Nordén 1930). Nordén's investigations of stone-wall areas were finally published in 1943.

This confusion as to the function of the stone walls apparently had a certain effect on the further archaeological interest in the stone walls of Östergötland. Few—if any—archaeological works mention their existence. But it is significant that an article written at a time when the geographical investigations (see below) of stone walls had just started. He saw the stone walls as representing a type of agrarian landscape which finally disappeared on account of the solskifte regulations in mediaeval times (1962:77). With his retrospective analyses of the 17th-century maps, he also managed to give a fairly clear picture of the preforms of the mediaeval landscape. The archaic settlement and field patterns in the earliest maps indicated that the pre-mediaeval landscape was characterised by single farmsteads with quadrangular fields, sometimes linked together by a common fence system (Helmfrid 1962:168 ff., 214 ff.).

1.2.2 The investigations at Halleby

During the 1950's and 1960's, investigations of stone-wall areas in Östergötland were carried out by the Department of Geography at the University of Stockholm. A preliminary report was given by Lindquist in 1962. A joint investigation by archaeologists and geographers was carried out in 1964 and 1965 in the Halleby area (see Figs. 1:4 and 1:6). The geographical part was published as a doctoral thesis by Lindquist in 1968. Lindquist discerned two types of stone walls:

(1) Stone walls functioning as barriers between different types of land use (Sw. hånad).

(2) Walls with other functions: earth banks (jordvallar), lynchets (åkerterrasser, åkerrenar) and walls with one single row of stones. Most of the walls of this type were boundaries within the arable land (Sw. begränsningar; Lindquist 1968:12).

The Swedish word hånad is used of all types of barriers, whether stone walls, hedges or railings. In the following pages the word ‘‘barrier’’ will be used synonymously with hånad, while ‘‘fence’’ will be reserved for post-and-rail and other wooden constructions (cf. Adams 1976:127 f.).

Lindquist also described and defined the other fossil forms in the area (see section 2.1). Mappings and field surveys at five different localities, together with the reports on the intensively investigated Halleby area, formed the basis of a synthesis of the development of the agrarian landscape during the first millennium A.D. The main results of his thesis were summarised in a figure (Fig. 1:3 in this work). The different stages may be described as follows (Lindquist 1968:47–49):

(A) Establishment of a landnam farm.

(B) A group of farms develops, with separately enclosed fields.
Fig. 1.3. Development of the agrarian landscape, according to Lindquist (1968:48). (a) Settlement, (b) stone wall (barrier), (c) arable land, (d) green, (e) cemetery, (f) abandoned elements.
19th century. The landscape thus takes on a fixed structure, which, according to Lindquist, lasted in principle till the 19th century.

(D) The removal of all farms to a common, regulated byomt.

Critical reviews of the thesis were published by Ambrosiani (1968) and Helmfrid (1968, 1969). The archaeological part of the Halleby investigations was published by Evert Baudou in 1973. His conclusions were on many points sharply opposed to Lindquist’s model of the development. His work is mainly devoted to a report of the total excavations of one of the settlement areas at Halleby, but two chapters treat the archaeological proofs for the laying out of a regulated, building toft during the 7th century A.D. (phase D in Fig. 1:3) and the establishment of the stone walls around the infield at Halleby (phase C).

Baudou shows that Lindquist gives no direct datings of the laying out of a regulated toft and of the barrier around the infield. In none of the cases, however, does Baudou show that the datings are incorrect, only that the proof of the early dating is still lacking.

A review of Baudou’s work was published by Näsman (1976), but few other archaeologists or geographers have taken up this thread again. One of the few written contributions to the debate on the Halleby results was also published by Näsman—in a critical review of the geographers’ work on the prehistoric material (Näsman 1979). Recently a contribution to the debate, based on the last inventory of ancient monuments, has been published by Winberg (1982).

1.2.3 Settlement development

As concerns the development of settlement within the totally investigated part of settlement area A, Baudou’s results are only to a small extent in contradiction to Lindquist’s.

Baudou discerns two periods of settlement—the earlier dated in the 3rd to the 5th century (maybe starting in the 1st century A.D.) and the later in the 6th century (probably also existing during the 7th century). Between the two periods, there is a break in the continuity. The new settlement uses a new type of house and a new grouping of the houses. Both settlements have been abandoned in connection with a fire (Baudou 1973:123).

Settlement area B at Halleby was investigated by Lindquist. It is situated at the northern end of a cattle path, where the path opens out to the pastures in the north. The last few centuries B.C. and the first six centuries A.D., give the chronological frame for this settlement. This coincides with the datings from settlement area A, except that the settlement in area A lasted for a few more centuries. Lindquist interpreted this as a removal or a plan to move the settlement in area B to one of the assumed, regulated tofts in area A. He assumed that this regulation of the tofts would have occurred in the period from c. 650 to 700 A.D.

Lindquist’s thesis also included a regional study, based on the inventory of ancient monuments and on his own surveys. He counted 43 settlement units within an area of 250 km² c. 400 A.D. The number of settlement units corresponds to less than a third of the historical byar and single farms within the area. This points to a much lower density than the figures later published for Öland, Gotland and Jæren (see above, section 1.1). This low density leaves space for further development, by the establishment of new units (see Lindquist 1968, Pl. 8).

The desertion of the settlement which both Lindquist and Baudou were able to document at Halleby was interpreted by Lindquist as being part of a general desertion of the whole eastern area of Östergötland. According to him, it affected almost half of the settlement units (Lindquist 1968:135). Lindquist interpreted the desertion as caused by war and migrations (1968:157). The map which was the basis for these calculations was criticised by Ambrosiani as being a dangerous mixture of empirical facts and model thinking (Ambrosiani 1968:305).

1.2.4 The laying out of a regulated toft

Lindquist assumed that the three enclosed areas in settlement area A at Halleby were three farm tofts. According to him, these tofts had been laid out after A.D. 590±65 (a radiocarbon dating of a fire-place under the stone wall enclosing the settlement). A metrological analysis of the enclosed areas yielded the result that they had been laid out with a foot measure of 33.0 cm—a measure which was widely used during the early Middle Ages in Europe. After excavation of the stone wall, Baudou was later able to show that this wall had been wrongly drawn on the map. According to him, the metrological analysis was accordingly valueless.

Lindquist considers that the tofts were laid out after A.D. 600, probably during the period A.D. 650 to 700 (Lindquist 1968:101). Baudou, however, considers that the stone wall around the prehistoric settlement must have been constructed after the settlement had been abandoned. The basis of his reasoning is that a track which leads up to the settlement is overlain by the stone wall. In my
opinion, the track may well have been used during an early stage of the settlement and later have been overlain by a stone wall enclosing the settlement during the 7th century.

Baudou explains the stone walls around the settlement as cattle pens dating from historical times (Baudou 1973:116, 131).

Since there is no clear stratigraphy in this case, all reasoning must be based on probabilities. The settlement enclosures were constructed after A.D. 590±65. They overlie a track leading from the settlement and thus cannot be contemporary with the oldest settlement (1st to 5th century A.D). On account of the way in which they are connected with a house foundation, they can most certainly be assumed to be contemporary with the house, i.e. the 6th to 8th century A.D. A less probable interpretation is that the house foundation was used in constructing a stone wall during historical times (Baudou 1973:115).

While the laying out of a regulated bytomt thus remains to be proved at Halleby, it is still highly probable that the stone wall was contemporary with the settlement and formed a kind of toft around the farmstead.
1.2.5 The establishment of an infield

From the investigations at Halleby, Lindquist drew the following conclusions concerning the landscape during the period 0 to 400 A.D.:

The settlement was loosely grouped, but functionally united to byar through the development of the physical structure of the agrarian landscape. Common greens, cattle paths and infields (gärden) are created in this connection. (1968:155 transl. by M.W.).

The dating of the infield was based on an assumed, functional connection between settlement, stone walls and arable fields at Halleby. Of these three elements, only the settlement and the arable fields were dated by excavations.

The fields at Halleby consisted of quadrangular or rectangular surfaces (25–40 m in width), bounded by low, drystone banks. There can be no doubt that they were permanent fields. Charcoal from the original clearing of the land was found directly under the stones in the banks. The clearing of the land could thus be dated to the first two centuries A.D. (Lindquist 1968:59).

However, no stratigraphical datings of the stone walls functioning as barriers were made at Halleby and the functional connection between settlement, stone walls and arable fields was questioned by Baudou. He showed that the stone wall around the infield was not uniform and held it most likely that as fences at Halleby the field walls date from historical times, chiefly mediaeval times or the end of the Iron Age at the earliest (Baudou 1973:131).

He considered the stone walls at Halleby to be a conglomeration of vestiges from different periods and with different functions.

Stone walls that were built to function as barriers are not as easily dated as banks within an arable field, since the construction of a barrier does not necessarily have to be preceded by a clearing by fire. Besides a stone wall is often dug down into the earth to escape the ground frost. The probability of finding datable material under it is therefore small. The dating of a barrier based on other constructions or layers superimposed on it is therefore often the only possible way.

At Röby, Slaka parish, a stone wall of the barrier type was investigated in 1973. It overlay graves dating from the period 0 to 200 A.D. and was antecedent to a layer of split stones containing pottery. Taking into consideration other cultural layers at the site, the layer of split stones can with great probability be dated in the Roman Iron Age or the Migration Period. The stone wall must thus have been constructed some time between 200 A.D. and 550 A.D. (Nilsson 1976 a).

1.2.6 Stone walls and farming systems

Lindquist never explicitly treated the farming system in his description of the early-Iron-Age, agrarian landscape. However, its similarity with the early mediaeval landscape is often mentioned:

The extent of the single settlement units, the location of the agrarian landscape, and its physical structure have remained unchanged since the Roman Iron Age... arable farming was carried out under the same conditions and with the same methods during the early Iron Age as later. (Lindquist 1968:135 transl. by M.W.).

This retrospective view of the early-Iron-Age landscape is clearly manifested in the reconstruction sketches of some stone-wall localities (1968:40-41). They all seem well adapted to some form of regular fallow system, with two or more separately enclosed fields.

In his review of Lindquist’s thesis, Helmfrid considered that most of the stone-wall localities had been single farms and not—as Lindquist assumed—groups of farms in a form of village community. Helmfrid saw the apparently uniform pattern of the stone-wall localities as a “a basic adjustment to the eastern Swedish type of physical landscape” (Helmfrid 1969:105). He also pointed to the fact that cattle paths are not as common in the landscape documented in the historical maps in Östergötland. These differences between the early-Iron-Age, agrarian landscape and the 17th-century landscape depicted on the maps have been shown to be important in the interpretation of the farming system.

The most obvious difference between the prehistoric landscape and the 17th-century landscape is, however, seen if the scale is changed. If we focus on the spatial connections between stone-wall localities instead of within them, another picture develops. When we studied the landscape around Skärkinds prästgård, Lennart Klang and I became aware of the similarity between the stone walls in Östergötland and the ensåde landscape in parts of Västergötland, which were still in use in the 17th century. We found that the lands belonging to the different settlements were not separated from each other, as is shown in Lindquist’s schematic demarcation of infields. The stone-wall systems were instead functionally united to each other and different settlements used barriers and outlying lands in common (Klang & Widgren 1973:51).

The organisation of the barriers thus shows a great similarity to the årliga brukets vångalag, which has been demonstrated by Campbell (1928:107) and is usually connected with yearly sown, arable land.

The comparison of the early-Iron-Age, agrarian landscape and the landscape of the 17th-century
maps thus points to vital differences in the farming system practised in the two periods. It was therefore natural that studies of the farming system should take a central place in the renewed investigations in Östergötland.

1.3 Arrangement of the work

Since differences in the farming system could account for the main divergences between the landscape represented by the prehistoric stone-walls in Östergötland and that of the 17th century, it was natural to ask whether changes in the farming system could explain not only those differences, but also the desertion of settlements and stone walls in the middle of the first millennium.

Four hypotheses were used as guidelines:

1. The basis for the early-Iron-Age expansion was the integration of arable farming and cattle-breeding within one farming system.

2. During this expansion period, new farms were gradually established as an inner colonisation on formerly unenclosed lands.

3. In the last part of the expansion, the central areas of Östergötland were fully colonised. The proportion of enclosed to unenclosed land may have been the same as in the 17th century.

4. The gradual increase of enclosed lands led to a disturbance of the relation between arable land, on the one hand, and pasture and meadow, on the other.

This set of statements can explain some of the features outlined in the preceding sections on the development of the early-Iron-Age landscape. Unlike the explanations which dominated research up to the early 1970's, it focuses the attention on the internal development of the agrarian society. The deeper causes of this development can, however, only be understood within the framework of an analysis of changes also in social organisation and in population.

Within this complex relationship of society, man and land, the present work is concentrated on problems of land use and farming system. Questions of social organisation have not been explicitly studied, but many of the findings on settlement, farming system and territorial organisation have clear, social implications (cf. section 3.3). The consequences of the findings on settlement density for the estimates of population have been discussed in subsection 5.2.2, but the role of population growth has not been dealt with.

Some of the possible deductions from an archaeological landscape are illustrated in Fig. 1:5. The main line of deduction involved in the present work is that in the lower part of the diagram—from a fossil, agrarian landscape to reconstructions of the farming system.

The step of inference from fossil landscape patterns to a reconstructed cross-section of the prehistoric landscape (from B to C in Fig. 1:5) presupposes assumptions concerning the processes which have disturbed and restructured the source material. An approach to this problem which can easily be applied to landscape studies has been presented by Schiffer (1976:11-40). Some of the source-critical problems in analysing fossilised forms in the landscape have been studied in a separate paper (Widgren 1982), based on the field evidence in section 5.1 in this study.

Even if we had managed the step from B to C, tackled all the chronological problems and established a perfectly dated cross-section of a prehistoric landscape, we would still only have reached the same point as the agrarian historian reaches when he gets the old cadastral map out of the archives. The map—or the reconstruction of prehistoric land-use—give only the physical framework within which the agrarian production took place. The farming practice and the functioning farming system remain to be interpreted by the student (a step of deduction corresponding to the step from C to D in Fig. 1:5). The analyses of the forms of the agrarian landscape and of the farming system that they may represent should therefore preferably be carried out in two different steps.

In summing up their book on field systems, Baker and Butlin called for a systems approach to the study of field systems:

It is necessary to ask of each system: what was its structure; how did it function; what degree of stability did it have; how did it evolve through time; how might it be expected to develop in the future (Baker & Butlin 1973:628).

The arrangement of this work follows—more or less faithfully—this chain of questions.

Settlement and land use in the Fläret area (Chapter 2)

My aim in this chapter is to establish the structure of the early-Iron-Age, agrarian landscape in eastern Östergötland. The dating of the long stone-walls—a problem which was left unsolved by Lindquist and Baudou—is the first problem to be dealt with. The second problem concerns the location of settlement in relation to the stone walls and the spatial connections between different settlements.
As an investigation area for this part of the study, I chose a square measuring 4 km\(^2\) located west of the present farm of Fläret in Askeby parish (Fig. 1:6). It contains a dense network of stone walls, house platforms and deserted arable fields. This area was chosen for the possibilities that it offers of making an analysis of the connections between many, different, settlement sites within one large area of stone walls.

While the field investigations in Halleby were concentrated on the settlements and the arable fields, I have concentrated in this chapter on the settlement and the long stone-walls enclosing the infield areas. No datings of the arable fields have been carried out.

The methods used in this chapter are mainly archaeological; settlement sites and stone walls have been investigated by digging trial trenches. The former use in one of the enclosed areas has also been investigated, using pollen analysis. For practical reasons, this investigation is described in Chapter 4. A cross-sectional reconstruction of settlement and land use in the early Iron Age is the final product of this chapter (Fig. 2:54).

**The farming system (Chapter 3)**

In the following chapter, an attempt is made to deduce the functioning farming system of which the structure documented in Chapter 2 is a result. By the term farming system, I mean the whole set of relationships between the different elements in a local farming unit—farming households, livestock, areas of different categories of land use, etc. The term is thus broader than the Swedish odlingssystem, which only describes the cropping pattern or the physical layout (cf. section 3.1).

The analysis of the farming system in this chapter has been made mainly by analogy with better-known systems, dating from historical times. The analogy has been tested in a computer simulation. In this chapter, the relation between the farming system, on the one hand, and the territorial and social organisation, on the other, is also discussed.

The aim of the chapter is to provide an answer to the questions of the stability of the farming system, its weak links and how it might have been expected to develop in the future.

The actual development of the agrarian landscape is analysed in the two subsequent chapters.

**Vegetational change (Chapter 4)**

In this chapter the landscape changes caused by man are described, using pollen analysis. The strength of pollen analysis, compared with the other methods used in this study, lies in its continuous description of vegetational change, which is, on the whole, independent of all the processes which have restructured and destroyed previous agrarian-landscape structures. In periods of stability and expansion, when fossil landscapes are not created, the pollen analysis is almost the only source available for research into the prehistoric, agrarian landscape.

The main pollen analysis was carried out in Lake Flären, in close proximity to the area investigated in Chapter 2, but it describes the vegetation in a much larger area. The aim of the chapter is to provide a measure of the relative intensity of land use during different periods and of changes in the relation between arable farming and cattle-breeding.

**Changes in the structure of the agrarian landscape (Chapter 5)**

The possibilities of describing the actual changes in the structure of the agrarian landscape during the late Iron Age are limited. In this chapter, datings of the different steps in the creation of the historical landscape are approached in two ways. From the evidence of the late-Iron-Age cemeteries, on the one hand, it is possible to form an opinion of the date of the dissolution of the large, stone-wall complexes. On the other hand, the same evidence can be used to date the origin of some of the features in the historical landscape, known from 17th- and 18th-century maps.

In this chapter, some estimates of the density of settlement in the early Iron Age and of the size of the Iron Age population are also discussed. Reconstructions of the 18th-century landscape from cadastral maps, together with field surveys of stone walls and cemeteries in two different areas (Skärkind and Gårdeby; see Fig. 1:6), form the basis of this chapter. Three cross-sections of a hypothetical, agrarian landscape (A.D. 400, A.D. 700 and A.D. 1700) summarise the findings (Fig. 5:13).
Fig. 1:5. A model of the relations between (A) a functioning system in the past, (B) its material remains in the present landscape and (C, D) the researcher's possible ways of inferring structure and system.
Fig. 1.6. Investigated areas on the Roxen plain, between Linköping and Norrköping. Halleby is treated in section 1.2, Fläret in Chapter 2 and Skärkind and Gårdeby in Chapter 5.
2 SETTLEMENT AND LAND USE IN THE FLÄRET AREA

2.1 The investigation area

In large parts of Östergötland, the prehistoric stone walls form a network underlying the present landscape. On some of the hills, the network becomes more dense and forms cattle paths and field systems. The scale level chosen to investigate these remains is of decisive importance for the comprehension of their structure. The conclusion in the work of Lindquist (1968), that few changes in the physical structure of the agrarian landscape occurred between the early Iron Age and historical times, was largely dependent on the fact that no areas larger than one square kilometre had been mapped. Furthermore, the Halleby area, which was the main area of investigation, is rather isolated and lacks direct connection with other stone-wall areas, although recent surveys have yielded new finds of stone walls in the vicinity (Winberg 1982).

The Fläret area in the south-western part of Askeby parish, which has been chosen as the investigation area for this chapter, is also peripheral but is still a good example of the network of stone-wall areas which cover the plain south of Lake Roxen.

This plain consists of a fine-meshed network of fissure valleys, whose main direction is between west and north-west and which include several transverse valleys. The land forms have created a very split-up landscape, in which moraines and clay valleys are intermingled. By definition, it is still a plain and the differences in level are relatively small. Over half the area is covered with clay sediments.

This physical landscape took on its final shape when the ice melted after the last ice-sheet and during the subsequent land upheaval (Bergström &
and from the top of the hills, all the fine material was transported away. Large boulders and gravelly till were left on the hills. In a small rim lower down the hills, sandy and silty soils were left, while the finest-grained particles were carried down to the valleys and formed large areas of post-glacial clay. In the bottoms of the valleys, the clay was often covered with different, organic deposits—Carex and fen-wood peat. These areas are today cultivated, but were used, until the end of the last century, mainly as meadow-lands.

Within relatively small distances, a number of different soil textures are therefore represented. The moraine hills have, during all periods, been attractive to settlements, because of their higher elevation, good exposure to the sun during the winter-time and well-drained foundations for buildings.

In the Fläret area, the boundary between the till and the finer sediments largely follows the 70-m contour and the till comprises, together with bare bedrock, some 40 per cent of the area.

In this type of landscape, it is difficult to find any naturally delimited, resource areas. Each agrarian unit—in prehistoric times or later—contains several hills with their interjacent valleys. In some cases, the valleys have served a gathering purpose—connected settlements lie around the valley—while in other cases they have separated settlements, with by or parish boundaries in the middle of the valley.

Two different cross-sections of previous agrarian landscapes can be recorded in the area, the oldest in the form of collapsed, drystone walls, which can mainly be dated to prehistoric times (see below). The next cross-section which can easily be recorded is the one depicted on the 17th- and 18th-century, cadastral maps, with single farms and byar (hamlets consisting of two to five farms; larger settlements are uncommon in this part of Östergötland).

In the southern part of Askeby parish, where the Fläret area is located, the settlement changes since the 18th century have been moderate. The laga skifte enclosure during the 19th century, which in other parts of Sweden led to the establishment of farmsteads outside the original hamlet, did not affect this area drastically. None of the eight hamlets in the southern part of Askeby were split by removals of farmsteads. Rationalisations of size and vast reclamations of wetlands have changed the landscape during the last 100 years, but, in spite of this, the settlement pattern has been more or less preserved since at least the 17th century, with one large farmstead, with its modern farm-buildings, on each mediaeval hamlet site. Previous pastures and hay meadows on dry ground are to a large extent still used as pastures today. The conditions for the preservation of fossil forms and the possibilities of documenting them are therefore extremely good in the area.

The central part of the stone-wall area at Fläret was documented by Lindquist (1968, Pl. 6). In this part, a cattle path stretches SE.-NW. and opens out to form greens around the settlement at two places. Within the greens, Lindquist was also able to document house platforms. This investigation covers a little more than 4 km², with the previously documented site in the centre. The area touches several historical byar, but the main part lies within the lands of Fläret (including Lövsveden).

The stone walls and other fossil forms in the area were mapped during the early summer of 1975 (Fig. 2:3). The central part of the map is a slightly revised version of the map of Lindquist (1968). Since 1975, minor additions to the map have been made, mainly during the following field seasons (1976 to 1978). The designation of sub-areas and stone walls on the lands of the present Fläret farm mainly follows Lindquist (1968). The areas outside Fläret are named after the present farms.

The following main elements are shown on the map (for a closer description and definition of the forms, see Lindquist 1968:9 ff.):

Stone walls (stensträngar). The map records as stone walls all low, linear, stone forms within the area. Walls running along the boundary of a recently cultivated field are only mapped if they can also be followed on ground not cultivated recently and they have the same character as the other fossil stone walls in the area. The main parts of such walls probably have the same origin as the others, but they still have a function in the landscape.

The analysis of the function of the stone walls (barriers or other) has been carried out after the mapping and is not marked on the main map (see below, subsection 2.2.2).

Terraces. The signs for terraces on the maps are used for both positive field lynchets (åkerterrasser, åkerrenar) and the outer edges of house platforms (husgrundsterrasser; for a definition, see Selinge 1977:167). Before excavation, the function of the areas within these scarpS may be difficult to decide.

Negative lynchets (äkernischer, åkerhak). One of the more frequent signs of previous tilling is the negative lynchets, which have formed on the upper part of previously cultivated land in the small rim of sandy soils on the hills. The corresponding positive lynchets are often missing, either because the soil has been cultivated recently or because it has never formed, owing to the slope conditions.

Clearance heaps. Unlike the previously mentioned traces of arable cultivation, early clearance heaps are not so easy to distinguish from the later forms which appear on 17th-century maps and later. In some
Fig. 2.2. Soil textures in the Flåret area. The northern part of the map is based on the geological map 
SGU Ae I4 (1973). The southern part is based on SGU Ae I4 (1912) and air photographs (LMV). Scale 
1:12 500.
Fig. 2.3. Fossil agrarian landscape in the Fläret area. Subareas Fläret A, B, C, D and E mainly based on Lindquist 1968 (Pl. 6). The other areas mapped by the author in 1975, with minor additions in the subsequent years.

The shaded lines denote the present farm boundaries and, within the farm of Fläret, different subareas.

For the explanation of the other symbols, see p. 125. Scale 1:7 300.
cases, even obviously late, clearance heaps have been mapped, where they indicated a cleared-away, stone wall.

**Bare bedrock.** In those cases in which rock faces formed a segment of a barrier, they were documented on the map (see sub-section 2.2.2).

**Graves and cemeteries.** The recording of graves and cemeteries in the area follows the survey made by the Central Office of National Antiquities. As the results of the last survey (1979–80) came into my hands at a late stage of this work, some inconsistencies may occur.

The above-mentioned fossil forms have been used below to interpret the following land-use categories:

**Cattle paths (fägator).** Where two stone walls run parallel at a distance of some 2–4 m, they have often been interpreted as cattle paths. In the most obvious cases, there are signs of erosion where the track slopes.

**Greens.** The cattle paths often open to form small areas of pasture around the house platforms. There are also signs that it was possible to close the greens: in some cases, remnants of a transverse stone wall in the cattle paths can be found. Lindquist used the term *inmark* for this type of land but was criticised, and the terms *centralmark* or *tun* were proposed (Helmfrid 1969, Ambrosiani 1968). The term *inmark* is used in other Scandinavian languages as synonymous with the Swedish *inägor* (see below).

**Inägor.** The term is used for the enclosed lands where both arable and meadow were located. The term *infield* is used in this work as synonymous with *inägor.*

**Utmark.** The cattle paths connected the green with the unenclosed common pastures or outlying lands, terms which are here used as both being synonymous with *utmark.*

In the investigated area, there are few signs of other land-use categories. Some stone walls may demarcate more intensively used pastures on the *inägor.* In some cases, small, enclosed areas are found on the greens or in the *utmark.* Their functions may vary. Many settlements have been enclosed in that way (see below), but other enclosures may have served as separately enclosed, arable land in the *utmark* (Sw. *lyckor*; cf. Fig. 5:10). They may also have been used as cattle pens.

### 2.2 The stone walls

#### 2.2.1 The stone walls and the historical landscape

A compilation of surveyors’ maps dating from the period 1691 to 1724 of seven of the nine byar in the investigated area forms the basis for a comparison between the system of stone walls and the agrarian landscape of the early 18th century (see Fig. 2:4). A study of the maps shows two discordant cross-sections. Both by-boundaries and 18th-century fences cut right across the system of stone walls. Of the 10 km of stone walls in the investigated area, only 5 per cent can be found on the 18th-century maps as fences. A close analysis of these cases shows that the barriers from different periods meet only for short segments of their respective runnings. This is also the case with the 1600 m of stone walls that served as field boundaries or fences and are shown on maps from the 19th century or later. In the 18th century, all barriers within the central parts of Östergötland seem to have been post-and-rail. They left no traces and can only be followed on the ground if they are still maintained as a barbed-wire fence today.

Occasionally, a barrier recorded on early maps may be represented by a stone wall. In such cases, the stone wall consists of a double row of large stones (often sharp-edged) with a filling of smaller stones, clearly distinguishable from the mainly prehistoric, collapsed, stone walls with a single row of stones.

During mediaeval times, stone walls do not seem to have been common in Östergötland. The provincial law (*Östgötalagen*) only speaks of wooden fences (höta för störar; stödstör ska sätta ett fjät från gårdesgården, ändan på hanken ska vara tumultång, Ögl. BB 14, Holmbecue & Wessén 1979).

The difference between the agrarian landscape represented by the stone walls and the early-18th-century landscape, shown in the Fläret area, is valid also in other parts of eastern Östergötland (cf. Chapter 5). It can already be confirmed at this stage of the investigation that the stone walls are generally a result of activities before the making of the historically documented landscape. Both the emergence of the two-field system and the establishment of the historical by territories are phenomena post-dating the majority of stone walls.
Fig. 2:4. The 18th-century landscape in the Fläret area, compared with the occurrence of stone walls. Five per cent of the length of the stone walls served as fences in the 18th century. Based on a compilation of large-scale maps dating from 1691 to 1724. Maps from Stämna and Nybble are missing. Scale 1:12 500.
2.2.2 The function of the stone walls

The definition of a barrier (hägnad) given by Lindquist can be divided into two parts, one of which relates to its appearance and the other takes into account its situation in relation to other elements. From the appearance of a stone wall, a judgement as to whether it can have barred the passage to livestock can be made. In this part of the definition, Lindquist says that a barrier is characterised by an abundant and even occurrence of a homogeneous stone material, the stones often being the size of a man’s burden. The biggest stones are concentrated in the middle of the wall; there are few stones the size of a fist and the wall is not mixed with soil to any great extent (Lindquist 1968:12).

The amount of stone in the barriers varied according to the supply and in some cases the barrier was made up of a single walling (enkelt murverk), in which the stones were only bound to each other lengthwise (Lindquist 1968:13).

Such single stone walls (enkla stengärdesgårdar; cf. Myrdal 1975:11) were in use, for example, in the provinces of Västergötland and Bohuslän up to our own time (see Cullberg 1978:14–15). Freezing and thawing made this type of wall collapse within a short period of time. In a fossil form, it does not have to be wider than three stones.

According to this definition of a barrier, most of the stone walls in Östergötland may have been barriers.

In order to reliably interpret the function of fossil stone walls, it is also necessary to consider their situation in relation to other elements. Lindquist says in the second part of his definition that walls of the barrier type can often be followed for kilometres and can be found as isolated phenomena on land that was never suitable for tilling, which distinguishes them from those developed as banks within the arable land. They are often connected with natural barriers, such as boulders and rock faces (Lindquist 1968:12, 18).

Where the rock face alone bars the passage to animals, stone walls are usually lacking and can be found only as fillings in small clefts. In the investigated area, it was in some cases possible to deduce the direction of the barrings, where a stone wall connected with a rock face (see below, section 2.2.3, under Lösvelden). This type of fencing, in which natural barriers are fully used, can still be seen maintained in the archipelago of Bohuslän (Fig. 2:5).

Where two stone walls run parallel, forming a cattle path, the function of walls as barriers is evident and stone walls that are direct continuations of cattle paths are also interpreted as barriers.

The interpretation of a stone wall as a barrier must thus be carried out in two steps, the first step being to consider whether the wall alone can have barred the passage of livestock. This interpretation can often be made at the first field survey, but excavations may complete—or change—it. The second step—to decide whether a stone wall has been deliberately constructed to serve as a barrier—is made as a part of the analysis of the whole system of stone walls, when its situation in relation to other elements can be judged.

In his critique of Lindquist, Baudou says that Lindquist passes too soon from the forms to definitions with functional implications (1973:120). With the two-part definition proposed above, one sees that the form of the wall (that it alone may have barred livestock) and its function (that it is situated in such a way that we can say with great certainty that it was designed to bar livestock) can be analysed in different steps.

The traces of arable cultivation are rather few in the Fläret area and do not cover large areas. No traces of a regular field layout, like the square fields at Halleby, have been documented within the area. The arable fields at Halleby are located in a large, flat, sandy area, which has not been cultivated in recent times. The corresponding soils in the Fläret area are confined to small rims around the hills. On these rims are traces of early cultivation in the form of lynchets (positive and negative), clearance cairns, stone walls (begränsningar) and surfaces cleared of stones. From the investigations at Halleby (cf. subsection 1.2.5) and at Skärkinds prästgård (cf. subsection 5.1), we know that these types of fields were used from at least the first century A.D. Since the main chronological problems involved in the investigations in the Fläret area are concerned with the age of the boundaries enclosing the infield area and their relation to the settlement, no further investigations aimed at dating the arable fields have been carried out. The distribution of these types of traces of early cultivation can be seen in Fig. 2:54.

2.2.3 The barriers between önägor and utmark

In the north and in the south-east, the Fläret area is bounded by long, stone walls, outside which very few traces of early cultivation can be documented. As will be shown below, these walls may be interpreted as barriers. They are connected either with natural barriers or with cattle paths in the central area. Before their dating can be discussed, their function must first be analysed. The interpretation of the central Fläret area made by Lindquist (1968:41) serves as the starting-point. The results of this analysis are shown in Fig. 2:54.
Stämna
A continuation of the southern arm of the cattle path leading north-west from the Fläret A sub-area can be followed in portions in the former meadow called Stämna Lund (Stämna 7, 6, 5, 4, and 3). Along a part of this segment runs a recent stone wall and it is probable that stones for this wall were taken from the stone wall of prehistoric type.

Stämna 6 is 2 m wide, consists of large stones and has the same form as the walls in the cattle path in Fläret A. North and east of it, there is an area rich in boulders. On its southern side, the land is flat, and parts of this area have been cultivated recently. The area between Stämna 5 and 4 contains a small rock outcrop and is rich in boulders, which may have served as natural barriers. This accounts for the apparently strange running of the walls. Stämna 4 is connected with some large boulders and with a small hillock, which may have barred animals from both sides. In the lower parts of the hillock, there are short fillings, which complete the natural barrier. Until 1979, this barrier had a continuation in the present arable land, where remnants of two stone walls running SW. and SE. could be seen.

From the southern arm of the cattle path in the Fläret A area a fossil barrier can thus be followed. Together with the natural barriers, it may have been 500 m long. The land west of the wall contains many patches of bare bedrock and boulders, while the land east of the wall was easily cultivated.

Stora Greby
The northern arm of the cattle path at Fläret A can be followed in a bow 200 m long (Stora Greby 11). North of this, there are further walls (Stora Greby 7, 9 and 10), but, because of the very dense vegetation, it has not been possible to document them as a whole or to make their function clear. Stora Greby 7 may have been connected with Stolpantorp 3, but the area between them has been damaged by recent cultivation and the digging of a large, drainage ditch. Stora Greby 8 runs through land which has been cultivated recently and cannot be followed outside the recent arable land. It may possibly have emerged as a recent field boundary.

Although the area is accordingly difficult to interpret in its northern part, it is still possible to reconstruct a large area of unenclosed land on the hill northwest of Fläret A. This formed a large pasture and was connected with the central Fläret area by a cattle path.
Stolpantorp and Nygård (Öjebytorp)

Across the lands of Stolpantorp and Nygård runs a 400-m-long stone wall (Stolpantorp 3, Nygård 13) in a wide bow with the main direction east-west. It is 2–3 m wide and consists of a large number of stones. The wall gives the impression of having been laid out as part of a deliberate planning of a large piece of infield land in the south.

In the west (Stolpantorp 3) the land is rich in boulders and the wall is connected with some very large boulders.

Close to the wall, on its northern side, is a small, natural water-hole. On the land of Nygård, the wall is connected with a larger water-hole in the east. A sunken track leads up to the water-hole from the north-west (south of Nygård 24). It has probably been developed by livestock straying in the areas north of the wall in the direction of the waterhole.

The breadth of the wall, and its connection with large boulders in the west and the water-hole in the east support the interpretation that this wall (Stolpantorp 3, Nygård 13) was a barrier enclosing an infield area in the south.

The stone wall, Nygård 26, some 10 m south of the water-hole, can be interpreted as a barrier on account of both its form and its connection with a boulder. From the same boulder, stone walls run towards the south-west and the east (Nygård 25, Nygård 1) and can also be interpreted as barriers. Nygård 1 runs partly along a recent field boundary, but, west and east of this, the wall is untouched by recent activities. The continuation of this wall (Nygård 2, Nygård 4) runs parallel to the contours for c. 400 m and has on its northern and western sides a tilly area rich in boulders and bare bedrock. It delimits areas with finer-grained soils in the south and east.

With smaller breaks, these walls (Stolpantorp 3, Nygård 13, 26, 1, 2, 4) form a 750 m long barrier. South of the barrier, there are lynchets, platforms, surfaces cleared of stones and further stone walls, some of which may have served as boundaries. North of this outer barrier, no large areas of early cultivation have been documented.

Flåret F

In the eastern part of the investigated area, a long, stone wall, running partly along a recent field boundary is found. It is connected with a rock face in the west and runs in part on lands never cultivated. Its function as a barrier is undisputed, but its close connection with the present arable land may, of course, indicate that it had a function as a barrier during historical times. It is, however, not mapped as a fence on the maps dating from 1695 and 1824–25.
It has been interpreted as belonging to the same period as the other stone walls. It delimits a probable pasture area in the north from enclosed lands in the south on the present, central, arable land of the Fläret farm.

Fläret C
The cattle path connecting Fläret B with Fläret C forms a natural starting-point for the further analysis of the barriers in the area. The northern arm (Fläret C2) can be followed only for a few hundred metres and it is not possible to reconstruct the boundary between inägor and utmark here.

The southern wall in the cattle path can, however, be followed almost unbroken for over 800 m, the main direction being southwards (Fläret C1, C3, C4 and E1). In the northern part this barrier follows the boundary between clay and till—a boundary which has in all times been an important, land-use limit. Parts of this barrier have been in use during different, historical periods. But at each period when the historical fences can be studied (1695, 1824–25, the 1970's) different parts of the wall have been used. The most probable interpretation of this coincidence between a stone wall and later barriers is that farmers in historical times.

The stone wall Fläret E1 runs parallel to the present fence, some 10 m from it. It is connected with a partly very broad, stone wall (Fläret E8), which is 180 m long and is situated in recently cultivated land. It is connected with a rock face in the west.

The main barrier (Fläret E1) continues southwards through a wooded area and is connected with stone walls at Lövsveden.

The walls Fläret C1, C3, C4 and E1 thus form a barrier, which is a direct continuation of the southern arm of the cattle path at Fläret C. It delimits the fine-grained soils west of the barrier. East of the barrier is a large area of till and bare bedrock, which has been used as utmark.

Lövsveden
The stone wall Fläret E1 continues as Lövsveden 14. It follows the western edge of a cemetery (Raä Askeby 164). In its south-western part, it ends in a recently cultivated field. There are many stone walls within the Lövsveden area which end in this recent field and it is difficult to determine which of them is the continuation of Lövsveden 14. A continuation of the barrier can, however, be seen south-east of the field, where Lövsveden 6 connects with the rock face. Together with the stone walls Lövsveden 5, 4 and 3, the rock forms a barrier running southwards.

The direction of the barring can be determined along this part of the barrier. Lövsveden 4 runs in its western part on top of a small rock crest. If the stone wall was intended to bar animals coming from the south, no stones would have been needed on the crest. The livestock could not have climbed up the rock face from the south. Close to the crest of the hillock, there is, however, a small, flat area of grass vegetation which could easily have been reached from the north by the animals. The stone wall was intended to bar animals from this side.

On the south-eastern side of the hill, the barrier continues with a 2–3-m-wide wall consisting of a large number of stones (Lövsveden 3). At its southern end, this wall ends in a recently cultivated field. The continuation of the wall has apparently been cleared from the field and the stones can be found in a recent wall close to the field. The wall (Lövsveden 2) continues 90 m to the south on the other side of the present arable land. After some 50 m it connects with a small rock. In the middle of the rock, there is a cleft, which is filled with stones to complete the natural barrier. The stones are located so as to bar animals from reaching and beyond the barrier. South of the rock there is a connection with Lövsveden 1 (Fig. 2:6). It can be followed for a further 50 m to the south.

A barrier can thus be followed from the central area at Fläret C down to the southern lands of Lövsveden (Fläret C1, C3, C4 and E1, Lövsveden 14, 6, 5, 4, 3, 2 and 1). On its eastern side, it has large areas of gravelly till and bedrock and on its western side, areas of fine-grained soils with traces of early cultivation and large areas of wetlands.

Conclusion
The analysis of the long stone walls in the Fläret area showed that they are mostly uniform in form as well as in function. In most cases, their function as barriers can be interpreted from their connections with the cattle paths in the central area or from how they connect with natural barriers. They form a boundary for the areas with traces of cultivation (lynchets, clearance heaps, short stone walls). In many cases, they follow exactly the limit between the coarse till and the more silty sediments, but first and foremost they enclose large areas of silty, clayey or organic sediments. The division of land use into two main categories—enclosed infield areas (inägor) and unenclosed pasture (utmark)—interpreted from the analysis above can be seen in Fig. 2:54.
2.3 The settlement

2.3.1 Aim of the settlement investigations

In the previous section, the broad division of land use indicated by the stone walls has been described, giving two elements in the structure of an agrarian landscape: enclosed, infield areas and outlying lands. The farmsteads represent the third element in the structure, being nodes where products are collected and stored and where cattle may be stalled and manure gathered. The settlement investigations in the Fläret area serve three purposes in relation to the questions posed in the first chapter:

*Datings of the stone walls* can be made in two ways. In so far as there is an indisputable, functional connection between settlement and adjoining stone walls, an *indirect dating* of the stone walls can be made from the age of settlement. Owing to the great activity at the farmsteads, the probability of securing a *direct, stratigraphical dating* of a stone wall is also greatest at settlements.

*Settlement localisation* in relation to infields, cattle paths and other settlements gives clues to the functioning of the farming system. The location of many dispersed farms at the junction between arable and pasture lands around a common infield is impractical in most systems of fallow. Two-field and three-field systems are thus usually connected with a concentrated settlement in some form.

The number of contemporary settlements within a given area shows whether the area was fully colonised or whether there was room for further expansion. The Fläret area is too small to yield a relevant estimate of the density of settlement. The figures from Fläret will thus only be used as a key to estimate the density on other, larger areas (sections 5.1 and 5.2).

The settlement investigations at Fläret were made in two steps: (1) field survey and phosphate mapping, in order to register all the possible deserted sites within the area; (2) test excavations at seven sites, in order to confirm the presence of a settlement and get a rough dating of the settlement and, if possible, of the stone walls.

2.3.2 Phosphate mapping

In the type of landscape found in eastern central Sweden, phosphate mapping, together with the keen observation of surface structures, is the most suitable method of surveying prehistoric settlements. Almost all deserted settlements are found in pasture or wooded land on till and bedrock. Systematic field-walking on cultivated fields on the bottoms of clay valleys is not likely to yield much information. In previous investigations in the same type of landscape, all settlements identified by other methods were also clearly documented by phosphate mapping (cf. Lindquist 1968, Klang & Widgren 1973, Sporrong 1968, 1971). Source-critical viewpoints on phosphate mapping have been presented by Cook & Heizer (1965), Larsson (1974), Kiefmann (1979), Sporrong (1979) and others. In the present investigation, the most important source-critical problem is whether a permanent, agrarian settlement can escape discovery, in spite of phosphate mapping. As far as I can see, the following errors are the most likely.

**Density of sampling.** In the present case, the samples were taken in a 40-m grid, on the basis of experience of previous investigations (cf. the literature mentioned above). In Lindquist’s studies most settlements were documented by four or more samples with distinctly higher values than the environment (cf. Lindquist 1968, PIs. 3, 4 and 5). A theoretical, circular, phosphate concentration must at this sampling density have an area of at least 2500 m² to have a chance to be represented by four samples on the map. An area of slightly more than 7000 m² would ensure representation by at least four samples. Between these two sizes, the probabilities of representation increase, depending on the random effect of the grid (cf. Larsson 1974).

**Different chemical methods.** Phosphorus occurs in the earth in many different forms. The main characteristic of phosphorus is its ability to form slightly soluble, calcium, iron and aluminium phosphates. Only a small fraction of the phosphorus in the soil is directly accessible to the plants. The most common method of analysing phosphorus in agricultural chemistry in Sweden is based on this and only a small fraction is dissolved (using AL-solution). In archaeological investigations in Sweden, citric acid is used. It is a stronger acid, but the method was developed mainly for agrarian purposes (cf. Troedsson & Nykvist 1973:82, Larsson 1974:1). By using hydrochloric acid, a larger fraction of the phosphorus in the soil is dissolved. The method is used in agricultural chemistry to determine the total stock of phosphorus in the soil. According to some authors, it is also the best one for archaeological purposes (Mauritzen 1970).

A comparison of the three methods has been made, using soil samples from the investigated area. The analyses with AL-solution and hydrochloric acid were carried out at the National Laboratory for Agricultural Chemistry (*Statens Lantbrukskemiska Laboratorium, Uppsala*) and those with citric acid at the Museum of National Antiquities (*Statens Historiska museum, Stockholm*). The results of the citric-acid method are given in 1/1000 per cent of P₂O₅.
Fig. 2:7. Phosphorus content in the soil at various depths, analysed using three different methods. For descriptions of the various sampling sites, see the text.

("phosphate degrees", $P^*$) by the laboratory and recalculated to mg P/100 g (cf. Larsson 1974, Fig. 21). The analysis includes 67 samples from different types of soil (settlement and non-settlement) and different depths (see below). The different methods give approximately the same picture, but some deviation occurs. The correlations between the different methods are shown in the following table:

<table>
<thead>
<tr>
<th></th>
<th>P–AL</th>
<th>P–Citr</th>
<th>P–HCl</th>
</tr>
</thead>
<tbody>
<tr>
<td>P–AL</td>
<td></td>
<td>0.93</td>
<td>0.83</td>
</tr>
<tr>
<td>P–Citr</td>
<td>0.93</td>
<td></td>
<td>0.81</td>
</tr>
<tr>
<td>P–HCl</td>
<td>0.83</td>
<td>0.81</td>
<td></td>
</tr>
</tbody>
</table>

As can be seen from this table, there are close correlations between the different methods. The values can be compared with those given by Kiefmann (1974:4), which show lower correlation coefficients. The stronger the acid, the more phosphorus is dissolved. This close correlation can perhaps partly be explained by the slightly acid soils in the area (average pH = 5.2). They have the ability to keep a large fraction of the phosphorus easily dissolvable (Cook & Heizer 1965:13, Troedsson & Nykvist 1973:81).

**Depth of sampling.** To ascertain whether the sampling depth used in the mapping (20–25 cm) can be considered representative, the distribution of phosphorus in depth was compared in five different soil profiles (see Fig. 2:7). Three of the profiles describe soil with different degrees of human influence and two of them describe soils in which the human influence has been restricted to mowing and extensive pasture.

**Profile G.** The soil profile is situated in an area with mounds of split stones. Within this area the phosphate content of the soil was high above the average. Probably a prehistoric settlement (see below, sub-section 2.3.10). Sandy till. The different curves show the same. The highest phosphorus content is to be found 25 cm below the surface and then diminishes downwards.

**Profile A.** The soil profile is taken from the settlement at Fläret II (see below). The sampling pit is situated in a prehistoric field about 20 m from a house platform. Mowing and pasture during historical times. The ground is covered with grasses and herbs and the soil is a silty material washed out from higher levels. At a depth of 60 cm, this silty material overlies a sandy till. Citric-acid-soluble phosphorus shows its maximum at a depth of 25 cm and hydrochloric-acid-soluble phosphorus at 35 cm.

**Profile B.** The pit is situated only 50 m from A, but lower down. Prehistoric field, mowing and pasture during historical times. Grass on a clayey soil. Citric acid has its maximum at a depth of 35 cm (but is only slightly higher than at 15 and 25 cm). Hydrochloric acid has its maximum at a depth of 15 cm.

**Profile F.** The sampling pit is situated in a spruce plantation in the woodlands south-west of Fläret. No known human influence, except extensive pasturing in earlier times. Grasses and heather. Silty till with a boulder or the bedrock at a depth of 60 cm. All methods show maxima at the bottom of the profile. The level coincides with a distinct layer of iron compounds.

The content of citric-acid-dissolvable phosphorus is thus often found to be highest at a level of 15–25 cm below the surface. Only in one case (E), in which no human influence is known, does the phosphorus content increase with greater depth. There is also a slight tendency to increasing phosphorus content with depth in sandy, permeable soils. To conclude, the sampling depth of 20–25 cm below the surface is thus reasonable.

From the investigated area, 2686 samples were collected. Samples are missing from some parts of the arable land, which was inaccessible during the sampling on account of growing crops. In the
south-western part, an area of 13 ha was not covered by soil samples.

The samples were analysed at Statens Historiska Museum, Stockholm. They were delivered at three different times and the last part of the analyses showed generally higher values than the two previous parts. The difference was shown to be systematic and appeared as sharp boundaries between the different parts in the first version of the phosphate map. The reason for this was changed routines at the laboratory. A check analysis was later carried out on 32 samples and showed that the final part of the analysis had on the average values 10 P\(^\circ\) higher. The map published here has been corrected, so that all the samples from the last part of the analysis have lower values than those given by the Laboratory. The correction was carried out with the help of an equation based on the 32 check samples.

The distribution of phosphate values is shown on the map (Fig. 2:9) and in the diagram (Fig. 2:8). Compared with previous analyses from Östergötland, this mapping shows very high values, with a median at 70 P\(^\circ\).

The major part of the area has evidently been influenced by human activities, in the form of phosphate from deserted or existing settlements or from manure and fertilizers on the arable fields. Low values are shown only in some rough pastures and woodland evidently never settled or cultivated. This high phosphate content forms a "background noise", making the identification of prehistoric settlement difficult.

2.3.3 Settlements indicated by phosphate mapping and field survey

On the map (Fig. 2:9) all values above 100 P\(^\circ\) (representing the upper 20 per cent of the values) have been marked. All concentrations with three or more adjoining samples on land not cultivated in recent times have been considered to be possible deserted settlements and will be described below.

Three types of concentrations can be distinguished on the map:

(1) **Historical settlements.** The farms and hamlets from historical times all show high values. Not only the settlement, but also the old arable land documented on the 17th-century maps show high values (cf. Arrhenius 1931). The concentrations in the north-west, north-east and south-east cover the oldest arable land in the hamlets Stora Greby, Öjeby and Fläret respectively. As can be seen most clearly in the case of Fläret, the values decrease with distance from the farmyard. The distribution of phosphate around the old settlements clearly reflects the long-term effect of farmyard manuring.

(2) **Artificially fertilized land on clay and organic deposits.** Arable fields cleared in the 19th and 20th centuries on former meadow land may also show high values, due to artificial fertilizing. The high values cannot usually be seen on phosphate maps made in the 1950's for agricultural purposes. There are no concentrations, but values are high and even over the whole surface within such an area. The soils (badly drained clay or peat) exclude the possibility of settlement as the causative factor. (Concentrations of this kind can be seen at x = 554, y = 484, in Fig. 2:9).

(3) **Concentrations on till, not cultivated or settled in recent times.** These values may be due to deserted settlements (prehistoric or mediaeval) or to various other activities during later times.

All sites indicated by the phosphate mapping, together with sites indicated only by surface features, were visited many times during April and May, when the vegetation hampers observation the least. Soil samples were taken from the sites with an auger. The names below refer to the present farms.

**Stora Greby.** The area indicated by high values was cultivated in the 17th century and most probably the high phosphate values were due to manuring with farmyard manure during historical times.

**Nygård I.** This site, which is covered by five samples above 100 P\(^\circ\), is situated far away from all known settlement and has not been cultivated. It consists of two small hills, well suited for settlement. It has no contact with the stone walls. No traces of settlement can be discovered on the ground. Soil samples and digging did not show any cultural layers. The site may possibly be a prehistoric one, but,
Fig. 2.9. High phosphate values and possible settlement sites in the Fläret area. The coordinates refer to the last three digits in the national grid system. Scale 1:12 500.
owing to the lack of connection with the stone walls, no further investigations were carried out.

Nygård II. This concentration refers to the present Nygård farm, known as Öjebytorp under Öjeby on the earliest maps. There are no traces of prehistoric settlement, other than graves, in the vicinity of the farm and it lacks connection with the stone walls.

Seländen. The site contained an active farm in the 17th century, but it was deserted during the present century. No traces of stone walls or prehistoric settlement in the vicinity.

Fläret I. The concentration covers part of a hill surrounded by clay. It contains stone walls and settlement remains in the form of house platforms (cf. Lindquist 1968). Soil samples contain charcoal, soot and burnt clay. Further investigations of the site will be described below.

Fläret II. House platforms were earlier documented on this site (Lindquist 1968). Soil samples contain charcoal and soot. Fifty metres north of the site, a small concentration of phosphate indicates an area within a small enclosure, where charcoal and burnt clay can be found in the soil. Further investigations of the site will be described below.

Fläret III. This concentration covers an area of more than 2 ha. In the western part, the cemetery Raä Askeby 147 may be the cause of the high values. The cemetery is characterised by late-Iron-Age forms and it is possible that they may cover earlier settlements. In an open pasture east of the cemetery, an enclosure measuring 40 x 50 m was found. Within the enclosure, low walls indicated a house. Dark soil and an abundance of burnt clay indicated a deserted settlement. Further investigations will be described below.

Fläret IV. The values are caused by the croft of Häradssveden, documented on the early maps and in use as a vacation house today.

Fläret V. The area consists of a small hill and, to judge from the topography, a settlement may well have existed there. No features of a deserted settlement have been observed on the surface. Within the area, no cultural layers could be found, but in the arable land close to the site, burnt clay was found. The possibility cannot at present be excluded that the site contained a prehistoric settlement; the phosphate concentration has not been explained by other factors. The site lacks connection with the stone walls and no further investigations have been made.

Fläret VI. This concentration refers to the present farm of Fläret. It might well have contained a prehistoric settlement but has no visible connection with the stone walls and there are no traces above ground of an earlier settlement.

Fläret VII. The site is located in a hilly terrain about 100 m from some cottages in the woodlands of Fläret and the concentration was probably caused by refuse-dumping during recent times.

Lövsveden I. No surface traces of settlement were found at this site, which has no direct connection with the stone walls. It consists of a small hill in the arable land and is encumbered with recent stones from the fields. Scattered finds of charcoal were made in the soil at a depth of 50 cm.

Lövsveden II. The concentration can be divided into two. Its northern part can be explained by the present settlement at Lövsveden, known from a 17th-century map. The southern part covers an area with mounds of split stones (skärvstenshögar) indicating prehistoric settlement. Further investigations are described below.

Nybble. The area with high phosphate values covers the southern part of a steep hill, with bare bedrock. Within the area, there are no topographically possible, settlement sites. No finds of cultural layers in the soil. The area may have been used for refuse-dumping during historical times.

Jorstorp. In the northern part of the hill, two minor scarps interpreted as house platforms were found. Stone walls lead from the southern part of the hill to the platforms. Charcoal fragments and soot were found in the house platforms. Further investigations are described below.

From the large number of phosphate concentrations, it is thus possible to select five possible settlements in connection with stone walls: Fläret I, Fläret II, Fläret III, Lövsveden II and Jorstorp. They are all characterised not only by high phosphate values but also by various fossil forms on the surface: house platforms, stone-wall enclosures and mounds of split stones. The field survey in connection with the phosphate mapping and the mapping of stone walls indicated the following two further sites with these kinds of surface features but with no phosphate concentrations, both situated in the northern part of the stone-wall system at Nygård (see map, Fig. 2:10):

Nygård III. On the southern slope of a hill, an enclosure comparable to those found at Fläret II and Fläret III is situated. It is smaller in size and forms a platform. Outside it, clearance heaps and lynchets were found. Charcoal was found in the soil. In spite of the low phosphate values, a settlement was suspected. A description of the investigations will be given below.

Nygård IV. On the eastern slope of a hill, two terraced stone-walls indicated house platforms. A description of the further investigations will follow below.

Thus, in all, seven possible, deserted settlements were identified in connection with stone walls. No dating of the sites is possible without excavation,
except that none of them showed clear, later traces of settlement, such as tiles, sharp-edged, ground stones, etc. At the seven sites, small excavations were made. The aims of the settlement investigations were as follows:

1. To ascertain the function of the site, i.e. to make it clear whether the phosphate concentrations, culture layers and platforms really were remains of settlements and not of other human activities.
2. To date the settlement as far as possible.
3. To date stone walls in connection with the site, mainly those with a clear function as barriers.

Methods of investigation

The possible settlement sites were investigated by digging trial trenches, in most cases 1 m wide and varying in length from 1 to 8 m. On each site, an area of between 7 and 25 m² was investigated. The trenches were, if possible, located so as to cover both settlement layers and a stone wall, in order to make datings of the wall possible. The trenches were documented with a plan and section. In most cases, the sections are projected and thus show all the occurrences of stones and layers within the 1-m-wide trench projected to one of the walls (the method is described by Lindquist 1968:53 ff.). This way of documenting a trench is especially valuable for linear elements, such as stone walls, scarp; at the edges of house platforms, lynchets, etc. All heights in the sections are given in centimetres below a local fixed point. The heights on the large-scale maps (1:1000) are given in metres below or above a local fixed point.

The first letter in the designation of a trench refers to the present farm on whose land it is located and the second to the order of excavation. Trench FC is thus the third trench dug on the lands of Fläret. In most cases, the occurrence of settlement layers, pottery and burnt clay made possible an interpretation of the site. The pottery is generally of a coarse, undecorated, red or black type, which cannot at present be dated to subperiods of the Iron Age. The burnt clay sometimes showed clear signs of having been used as daub (wedge-shaped and/or with imprints of wattle and grass).

Most of the datings are based on radiocarbon-dated charcoal from settlement layers and fireplaces (see Table 7 p. 126). The problems connected with radiocarbon samples from small trenches have been discussed by Näsman (1979:169 f.). In the present investigation, the problems can be illustrated by the radiocarbon samples from trenches FD (subsection 2.3.6) and LD (subsection 2.3.9). In these two cases, neither the function of the charcoal nor any stratigraphy between the dated charcoal and other structures was clear and the results are thus of little value.

From the trenches in the settlements, the following two types of radiocarbon samples have been preferred:

1. Samples from well-defined structures, such as fireplaces or post-holes. They are marked with a circle and a Roman figure on both plan and sections.
2. Samples collected by sieving and flotation from a clearly defined layer. They are usually marked with a small circle and also a rectangle showing the extent of the sieved volume of soil in the section but are not marked in the plans.

The radiocarbon analyses were carried out at the Swedish Museum of Natural History (Laboratoriet för isotopgeologi, Naturhistoriska Riksmuseet, Stockholm). The values have been corrected according to the tables in Damon et al. (1974). The sample St 6475, for example, is dated A.D. 165±90 (160), which means that the corrected value is 165 calendar years after the birth of Christ; the confidence interval is ±90 years and the age in radiocarbon years is A.D. 160 (T=5568 yrs). The corrections of the radiocarbon time-scale are of little significance for the periods studied in this chapter, but for the sake of consistency all the values have been corrected.

The radiocarbon dates do not, of course, date the whole period of settlement at a site but give only one date at which the site was in use.
2.3.4 Nygård III

The site is located on a small moraine accumulated on the southern side of bare bedrock. An almost quadrangular platform—30 m square and bounded by stone walls on three sides—is situated close to the top of the hill. Further down the hill, traces of earlier cultivation can be seen on the moraine. Short lynchets and clearance heaps show that the area was at one time under cultivation. The site is located inside the infield barrier Lövsveden 13 and no connections with the outlying lands in the form of cattle paths have been identified. The nearest water-hole is situated 100 m north-east of the site outside the barrier. A sunken road leads up to the water from the unenclosed lands (walls Nygård 13 and 24; see Fig. 2:10), but there is no visible connection with the settlement.

Inside the platform, the ground is flat and no traces of houses can be found on the surface. Samples taken for the main phosphate map did not indicate any settlement at this site. None of those samples were, however, taken from the platform itself. Denser sampling was therefore carried out around the site in a 10-m grid covering an area of 360 m² around the site. Eighty per cent of the samples showed values less than 60 P°. An area close to the opening in the wall and outside the platform showed values between 70 and 110 P° (see Fig. 2:12).

Trench NC (3.85 m³). This trench was dug inside the enclosure at a place were probing had showed sooty soil with charcoal and the phosphate mapping showed high values. The excavation revealed a fireplace with a diameter of over 2 m. It was filled with sooty soil, burnt stone and charcoal. A sample of charcoal from the hearth was dated to A.D. 185±90 (180). In the light of the few finds of pottery and burnt clay, the function of the site is, however, not clear from this trench alone. Finds: Pottery 17 g, burnt clay 8 g, fragments of burnt bones.

In order to find more distinct traces of settlement, three 1-m squares were dug at different places on the platform:

Trench ND (1 m²). This square revealed no constructions or clearly defined, settlement layers. There were signs that the soil had been disturbed. Finds: Burnt clay and daub 54 g, pottery 15 g, a fragment of a glass-paste bead (reddish-brown with a green, zigzag decoration), a piece of slag.

Trench NE (1 m²). Natural, brown soil. Finds in the upper layer: Pottery 6 g.

Trench NF (1 m²). Natural brown soil with signs of darker sooty soil in a small area. Finds: Burnt clay 6 g.
Fig. 2:11. The Nygård III site seen from the SE.

Fig. 2:12. Settlement at Nygård III. The shaded area has a phosphorus content of over 70%. Scale 1:1000.

Fig. 2:13. Trench NC. Plan and sections. Scale 1:40.
Fig. 2:14. Trench NG. Plan and projected section. Scale 1:40.

Fig. 2:15. Trench NG. Photographic plan c. 15 cm below the surface.
Trench NG (5 m²). The trench was laid out over the surrounding stone wall in a place where sooty soil had been discovered by probing. The stone wall was formed by half-metre-sized boulders, three or more in breadth, and was broad enough to have formed a barrier. Among the larger stones, a packing of cobbles was found, probably having been cleared from the platform or the adjacent fields. Inside the wall, a fireplace was situated. It consisted of black soil, charcoal and a layer of burnt stones. The fireplace overlay stones in the stone wall. Two samples of charcoal post-dating the construction of the wall were radiocarbon-dated to A.D. 205±90 (200) and A.D. 20±90 (30). The finds of burnt clay and pottery sherds were situated between 100 and 300 (see Fig. 2:14). Overlying the hearth, a quernstone (malsten, liggare) was found upside down.

Finds:
- Burnt clay 17 g, pottery 3 g, fragments of burnt bones, the quernstone of a handmill.

Conclusions. Within the platform, no house foundations were identified, but the two fireplaces and the finds of pottery, daub and a quernstone should be interpreted as indicating an abandoned settlement. The most probable location for houses would have been just north-west of the trench NG, where the stone wall may have formed a part of the house wall. The radiocarbon-dated charcoal indicates that the settlement existed at least some time within the time span 70 B.C. to A.D. 295. The stone wall around the settlement was built during this period or earlier. Besides the traces of cultivation on the ridge south-west of the site the arable fields have probably been located on the slope 150 m south-east of the site, where the land south of the walls Nygård 17 and 18 has been cleared of stones. Tilling is indicated by the negative lynchets at Nygård 18. Nygård 20 and 21 developed as positive lynchets when the lands west of them were cultivated.

2.3.5 Nygård IV

On the eastern slope of a small hill, flattened areas—possibly house platforms—were found inside a stone wall (Fig. 2:10). The stone walls indicate a connection between the site and the unenclosed land to the north. A slight scarp, bounded by a low stone wall, was found north-east of the flat areas. The general phosphate mapping showed somewhat raised values on the hill. A denser sampling in a 10-m grid revealed an area inside the stone wall with significantly high values.

Trench NA (6 m²). The slight scarp north-east of the hill was suspected to be the outer edge of a house platform. The stone wall (Nygård 5) was seen as a level row of equally sized stones before the excavation. However, no occupation layer was found in the upper part of the trench. In the lower part, there was a packing of sharp-edged stones, probably cleared from land east of the stone wall. The cobbles and the stone wall both overlay a flat fireplace containing soot and charcoal. Charcoal from the fireplace was dated to 155 B.C.±90 (125 B.C.). The function of the wall remains unclear. It may have been connected with the barrier in the north or developed as a field boundary when the land south-east of the wall was cultivated. Finds: Pottery 13 g, burnt clay 27 g, fragments of burnt bones.

Trench NB (4 m²). The trench was dug in order to investigate one of the suspected house platforms on the hill. It revealed a considerable stone wall with boulders in the middle and smaller stones on both sides. There were enough stones to form a barrier, but the scattered stones of different sizes on both sides of the wall suggested that the wall was subsequently formed by clearing the land on both sides. A natural, sandy soil was found in the upper part of the trench (200–400). A slightly dark part of
the soil—as if left by a stump or after digging—was situated at 280 to 320. The most probable interpretation of the stone walls and the flat areas at this site is that they represent traces of cultivation. In spite of probing and digging at several places in the flat areas, no settlement layers were found. Finds: Burnt clay 41 g, pottery 12 g.

Conclusion. The hill was evidently used in the early Iron Age, but no settlement contemporary with the stone walls was found. The flat fireplace under the stone wall in trench NA and the scattered finds of prehistoric pottery and burnt clay indicate a certain human activity in prehistoric times, but no permanent settlement. The stone wall Nygård 5 was constructed after or during the period 245 B.C. to 65 B.C.
2.3.6. Fläret I

The site is described by Lindquist (1968:33 ff.). One distinct house platform in close connection with stone walls draws one's attention. It measures some 5 m by 15 m and its outer edge is situated about 1 m above the adjacent land. Other platforms—not so easily distinguishable—can be found some 50 m further west.

From the east a cattle path, consisting of two parallel, stone walls, runs up to the hill and widens to form a kind of green. The northern stone wall has been destroyed by later cultivation, as is indicated by the heaps of stone, but traces of it can be found west of the hill, leading to further pasture areas. Straying cattle were thus confined to the area on the top of the hill, with bare bedrock or thin soils; areas with greater soil depth have been included in the infield north or south of the hill. The settlement is situated at the junction of these two types of land, but on the infield side of the barrier. A sunken track leads up to the settlement, following closely the southern barrier. It ends at the most distinct of the house platforms. West of trench FE, the wall forms a Y to permit the cattle to reach a small water-hole (Fig. 2:25).

The clear, functional connection between settlement and stone walls at this site called for investigations at all possible sites for houses. This was done by digging trenches at house platforms and topographically possible locations (trenches FC, FF and FG), combined with 23 sampling pits in a 20-m grid to ensure that all settlements were recorded. The locations of sampling pits and the occurrence of pottery in them can be seen in Fig. 2:25.

Traces of cultivation can be found on the slope south of the house platforms. Clearance heaps and irregular stone walls indicate tilling, but there has also been cultivation during the late 19th and early 20th centuries, so the early traces are confined to small areas. The barrier east of the most distinct platform (the stone wall Fläret B 7–8) has on its eastern and southern sides a distinct, negative lynchet. A plot measuring 3000–4000 m² can be identified there. The soil consists of fine, sorted sand, but lower down clay is found. As narrow ditches indicate, parts of the plot have been used in recent times.
The areas with traces of cultivation all showed significantly higher values of phosphorus content than the surrounding areas (see Fig. 2:21). If the phosphorus values at the site were only the effect of the accumulation of manure and debris outside the houses, one would expect a more concentrated occurrence. Areas of similar sandy soils, close to the settlement, which are cultivated today, also showed higher values than the surrounding land. The area north of the cattle path, for example, yielded in the dry summer of 1975 a better harvest than the rest of the field, in spite of its permeability (pers. comm. from the farmer, Sven Carlsson).

Similar distributions of phosphorus in the soil have been shown around deserted farms in south-western Norway (Provan 1973a, b). Provan interprets these as having been caused by a deliberate effort to improve the soil by manuring. The shaded area on the map (Fig. 2:21) may accordingly be interpreted as the intensively cultivated and manured, arable fields belonging to the farm.

This interpretation may in part be supported by the finds of pottery in the sampling pits (Fig. 2:25). In all sampling pits on land that showed traces of early cultivation and in the higher, well-drained parts of fields cultivated today, small sherds of abraded pottery were generally found, probably indicating a distribution of manure and debris on the arable land (cf. Bradley 1978b and the literature cited there).

Trench FC (8 m²). The trench was laid out across what was supposed to be a small house, indicated by a platform some 5 m wide and at least 8 m long. Ten to twenty centimetres below the surface, burnt clay and sherds of pottery were found. Among the pottery in the superficial layers was a sherd of a cheese-strainer (silkärl), a common find in fortified settlements dating from the Migration Period in Östergötland (Nordén 1938:285 ff.). Sherds from strainers were also found in the upper layers at Halleby, corresponding to a house dating from the fifth and sixth centuries. In an earlier, underlying house (fourth century), no sherds from strainers were found (Baudou 1968:18). The dark soil and the finds of burnt clay were concentrated between two rows of stones (at 240 and 560 respectively), which probably delimited the walls of the house. At 280, a post-hole was found, filled with slightly dark soil but no charcoal (see Fig. 2:24). Two charcoal samples were collected from the lower occupation layer in the house some 40 cm below the surface and yielded the following ages: A.D. 15±110 (A.D. 25) and A.D.
165±110 (A.D. 160). Outside the northern wall at 680 to 760, a flat fireplace was situated. Charcoal from the fireplace was dated to A.D. 165±90 (160). The trench evidently cut across a small house 3.5–4 m wide. The charcoal samples indicate that the site was in use at least for some time during the period 175 B.C. to A.D. 180. The findings of a sherd of a strainer may indicate settlement in the fifth and sixth centuries A.D. Finds: Pottery 406 g (including a sherd of a strainer), burnt clay and daub 1702 g (of which two pieces had had wattle imprints), a glass bead (blue, double conic), fragments of burnt bones, seven fragments of trundles or whetstones and four carbonised seeds.

Trench FD (5 m²). Outside the house foundation (trench FC), charcoal and soot were found in soil samples. Before the excavation, the concentration of charcoal was thought to have been an outdoor fireplace in the settlement, but the charcoal turned out to consist of many concentrated accumulations of large pieces. Very few of the stones in the trench showed signs of fire and no circular arrangements of stones could be found. Thus the charcoal cannot be interpreted as a permanent fireplace. Outside the concentrations of charcoal were found pieces of burnt clay, pottery and bones. At the excavation, the charcoal layer was interpreted as being a part of a debris layer from the nearby house or the remnants of an occasional fire. Two charcoal samples were radiocarbon-dated. Sample I (St 6478) was one large piece of charcoal that had come from a root or the bottom of a branch of a large tree. Sample II (St 6479) was taken from the concentration at 140. Compared with the age of the house foundation, both samples yielded unexpectedly late dates A.D. 1050±90 (1045) and A.D. 1310±90 (1330) respectively. The lack of a clear connection between the debris layer and the charcoal makes any conclusions drawn from the samples uncertain. A closer examination of the drawings shows that the charcoal may well be the remains of an occasional fire on the spot (perhaps of a stump or standing tree, as indicated by the supposed root), without any connection with the house foundation or the debris layer.

The dark layer at 230 to 270 contained charcoal in smaller pieces. In contrast to the dated charcoal, this layer was locked by a layer of stones. The amount of charcoal was, however, not enough for dating. The trench was not dug down to the subsoil. Finds: Burnt clay and daub 553 g, pottery 67 g, an unidentified object of iron 29 mm long, fragments of bones and animal teeth, three fragments of trundles.
Fig. 2.23. Trench FC. Plan and projected section. Photographic plan c. 25 cm below the surface. Scale 1:40.

Fig. 2.24. Trench FC. Post-hole at 280. Scale 1:10.
Fig. 2:26. Trench FD. Plan and projected section. Only the lower part of the plan is represented in the section. Scale 1:40.

Fig. 2:27. Trench FF. Plan and projected section. Scale 1:40.

Fig. 2:28. Trench FE. Plan and projected section. Scale 1:40.
Trench FE (4 m²). The stone wall through which this trench is cut is a part of the long barrier connecting the Fläret I site with the settlement at Fläret II. Further east, it joins with another wall to form a cattle path. At the site of the trench, it separates a pasture area to the north from the settlement. Before the excavation, dark soil had been found by probing on both sides of the wall. Two clearly separated, culture layers were found in the trench. The superficial soil in the upper part of the trench (200 to 400) had accumulated after the construction of the wall, but only a small dark layer was found (380 to 400). It contained neither artifacts nor charcoal in datable amounts. The wall had been constructed on an older fireplace 2 m in diameter, full of shattered and burnt stones and charcoal and with some small pieces of pottery. Two samples from the charcoal were radiocarbon-dated to 450 B.C. ±100 (375 B.C.) and 360 B.C. ±95 (300 B.C.). The large boulder in the wall was laid directly on dark soil from the fireplace. Finds (all found in the layer under the wall): Burnt clay 20 g, pottery 68 g.

Trench FF (3 m²). No dark layers were found by probing on the largest house platform in the area. To ascertain the function of the platform, a small trench was excavated. No distinct culture layers or constructions were found, but the amount of pottery and burnt clay indicated some permanent activity on the platform. The amount of pottery (48 g/m²) almost equals that in trench FC (51 g/m²). The direct connection with the stone wall and the sunken track may indicate that some kind of cattle shed had been situated on the platform. The trench was not dug down to the subsoil. Finds: Burnt clay 203 g, pottery 145 g and slag.

Trench FG (1 m²). As indicated by the contours, the area around trench FG may have been a house platform. The dense vegetation, however, does not permit an outer delimitation of it. At 20 cm below the surface, a pit with burnt stones, charcoal and sooty soil was found. A charcoal sample (St 6961) was dated to A.D. 30±95 (40). Finds: Burnt clay 30 g, pottery 12 g.

Conclusions. The settlement on this site—in a clear, functional connection with the stone walls—existed at least in the first and second centuries A.D. as shown by four radiocarbon-dated samples. A previous settlement left traces in the form of a fireplace dated to the third and fourth centuries B.C., underlying a stone wall. In spite of the digging of trenches at all possible sites for houses and 23 sampling pits, no trace of settlement later than the sixth century A.D. was found.
2.3.7 Fläret II

The site consists of two hills (sub-areas Fläret C and D). Phosphate mapping indicated two possible locations of houses: on the north-eastern part of hill C and on the eastern side of hill D inside the small enclosure. The southern hill is connected with Fläret I by a cattle path. The main part of the hill has evidently been used for pasturing. In the eastern part, some complicated structures are formed by the stone walls. The walls C14 and C17 delimit on their northern sides an area of arable fields characterised by bowl-shaped depressions between low stone walls (nos. C15 and C16) (see Fig. 2:30). The area south of C14 was interpreted by Lindquist as a house platform. It is rectangular in shape and is delimited at its northern and western ends by the stone wall. Inside the platform, which measures 30 × 12 m, the ground is flat, but some minor scarps can be found. The field walls on the south-eastern part of the hill (C5 to C9) also delimit some stone-cleared surfaces with slightly concave surfaces, probably arable fields.

Trench FH (8 m²). A profile was laid out inside the supposed house platform (see Fig. 2:31). Three trenches were dug within this profile. Before the excavation, the slight scarp at 1700 was supposed to be caused by structures below the ground surface, but the trench between 1500 and 1900 revealed that the underlying bedrock had determined the surface features. Only scattered finds of pottery, burnt clay and some small fragments of burnt bones were found within this trench. No constructions were indicated by the stones. Between 1100 and 1300, another trench was dug. No settlement layers were found, but some large pieces of pottery were turned up. Around one of them, a small area of dark soil was found. The trench at 400 to 600 showed neither finds nor dark soil (no drawings published). Since no distinct settlement layers and no constructions have been found in the trenches, the interpretation of the supposed house platform is not clear. Although soil samples were taken at many places within the platform, no dark layers were found. The finds of pottery and burnt clay, of course, indicate prehistoric activity on the platform, but without further investigations the function of the platform cannot be determined. Finds: Burnt clay 97 g, pottery 200 g
Fig. 2:31. Settlement at Flåret II, Scale 1:2 000.
Fig. 2.32. Trench FH. Plan and projected section. Scale 1:40.

Fig. 2.33. Trench FJ. Plan and projected section. Scale 1:40.
Trench FJ (7 m²). Since charcoal was found in soil samples on the upper side of stone wall C21, the possibilities of dating the wall were considered good at this place. The wall is a direct continuation of the cattle path connecting this site with Fläret I. Because of the slope, the wall had a rather complex structure. Its central part—visible on the surface—consisted of two rows of stones, each of them kept in place by a lot of small, wedge-shaped stones. Many of the stones were too small to be documented in the drawings. The lower row of wedge-shaped stones was situated at 470 to 560 and the upper row at 340 to 380. The stones on the upper side of the wall (100 to 270) are joined to the central part of the wall. Their function is uncertain, but they were placed in position after the construction of the wall. As is clearly shown by the use of wedged stones, the original slope was too steep to keep stones from creeping down. The stone wall and its upper extension thus form a terrace, which keeps the soil and smaller stones on the upper, flat surface in place.

The upper, dark layers and concentrations of charcoal shown in the section (0 to 340) all post-date the construction of the wall. Between 0 and 180 two distinct layers can be identified. In parts of the trench, the two layers are separated by a layer of small stones. The upper layer (A) consisted of a carbonised stem 1.2 m long and 0.12 m in breadth. Intermingled with carbon of the same type in smaller concentrations were patches of yellow sand scorched by fire. A radiocarbon sample (St 6963) showed that the carbonised wood was of recent origin. Layer B consisted of a dark soil containing burnt clay and small pieces of charcoal. At 90 cm, a 30-cm-broad, crescent-shaped concentration of charcoal was found in the eastern wall of the trench (not documented in the plan). All the fibres in the charcoal were vertical, indicating that it was the bottom end of a post. The date of the wood in the post, according to the radiocarbon dating, was A.D. 275±95 (265).

The lower end of the dark layer (180 to 600) was not clearly separated into two layers. Some superficial patches of yellow sand can be connected with the recent fire (layer A), but most of the layer consisted of a light soil of the same type as B. Most of it has filled in the hollows in the stone wall over a long period and no stratigraphy can be established, except to say that all of it post-dates the wall. Scattered finds of charcoal, burnt clay, daub and prehistoric pottery, as well as a recent rifle-bullet, were found in this layer. Two samples of charcoal from a hollow in the wall were dated to A.D. 1430±170 (1460) and 1465±110 (1495) respectively. Finds: Burnt clay and daub 475 g, pottery 15 g, a fragment of iron, and a recent rifle-bullet.

Finds in both trenches indicate settlement on the hill, but the exact location cannot be determined. Besides the supposed house platform, buildings may
have been situated on the flat area limited by the stone wall C17 in the east, C20-C21 in the north and the water-hole in the south. The many finds of burnt clay in trench FJ showed clear traces of having been used as daub—wedge-shaped and/or with imprints of wattle—which indicates that houses may have been situated close to the upper end of that trench.

Only 100 m north of trench FJ, another phosphate concentration was found within the enclosure formed by the stone walls Fläret D8, D11 and D12. Within the area with high phosphate contents, charcoal and soot were found in soil samples. Some very slight scarps—not mapped—can also be seen in the area. Thus, many indications pointed to a settlement in the eastern part of the enclosure. Two trenches were dug along the same section.

Trench FK (2 m²). The charcoal found in soil samples proved to emanate from a small fireplace 1 m in diameter, with small, fire-cracked stones around a central area of sooty soil. Above the fireplace was found a sherd from a cheese-strainer. A charcoal sample from the fireplace was dated to A.D. 120 ± 110 (120). Finds: Burnt clay 170 g, pottery, 67 g (one sherd of a strainer), and a fragment of iron.

Trench FL (5 m²). The trench was cut through the stone wall with the object of investigating the chronology as between the settlement on the hill and the stone wall. The stone wall included enough stones to have formed a barrier. In the layers on both sides of the wall, burnt clay, charcoal and pieces of slag were found. In the middle of the wall, a very loose soil—rich in humus—had accumulated among the stones. In this soil, two sherds of pottery were found. From a layer just inside the wall, charcoal was collected for dating. The layer was kept in place by the wall. The wall was thus probably constructed before the date indicated by the radiocarbon analysis (A.D. 185 ± 90 (180)).

Conclusions. Within the Fläret II site, one definite area of settlement has been identified on the northern hill. Two radiocarbon-dated samples indicate the period A.D. 10–275. The stone wall around the settlement was constructed before or during this period. Buildings may also have been located on the southern hill, although no definite traces have been found. The finds and the phosphate concentrations on the southern hill may also have derived from the settlement only 100 m further north.

The northern wall in the cattle path (C2 and C21) connecting Fläret I with Fläret II was constructed some time before or during the period A.D. 180–370.
2.3.8 Fläret III

The site is characterised by an enclosure of stone walls measuring 40 m by 50 m and more or less rectangular. Within the enclosure, low banks of stone and earth indicate a house foundation. The banks may have formed a gable and wall in a house measuring 8 m by 18 m. However, no signs are to be seen of the eastern house-wall. When soil samples were being taken for phosphate mapping, an abundance of burnt clay was found close to the supposed gable. The site is part of a larger phosphate concentration, including the historical fields of the Fläret farm and a large part of the burial grounds west of the site.

*Trench FA* (6.5 m²). The trench was located so as to cut across the outer stone wall, where it probably formed part of the northern gable as well. Dark soil, broken pottery and burnt clay were found just below the turfs. At 140, there was a small accumulation of burnt stones. It was probably a small fireplace, from the higher parts of which charcoal and soot had been washed by the rain (the fireplace is situated only 15 cm under the present land surface). Charcoal from this fireplace was dated to A.D. 90±90 (95). At 320, there was another small accumulation of stones, some of them burnt, and a scattered occurrence of charcoal. Charcoal from this stratum was collected by sieving and dated to 30 B.C.± 145 (15 B.C.).
pottery was found on both sides of the stone wall and in no case under it, indicating that the construction of the stone wall preceded the settlement. The stone wall can hardly have been constructed after the fireplaces were in use. As can be seen from the section, the soil around the dated charcoal would not have been kept in place, had it not been for the stone wall. To judge from the dark soil and the amounts of pottery, daub and burnt clay, the trench cut through a house. Finds: Pottery 217 g, daub and burnt clay 177 g (two pieces of daub had distinct impressions of wattle with 1-cm-thick wickers and on one piece of burnt clay there were impressions of grass), a segmented bead of amber, and burnt bones.

Trench FB (2 m²). As can be seen from the contours on the map (Fig. 2:38), the central part of the enclosed area is flat. On the surface, an irregular accumulation of stones forming a half-circle can be found. Probing revealed dark and sooty soil in the middle of this area. A layer of burnt stones was found only 10 cm under the surface. Under the stones (15–20 cm thick), there was a sooty layer rich in charcoal. The half-circle of stones probably delimits a large, open-air fireplace. Charcoal from the fireplace was dated to 55 B.C.±90 (35 B.C.).

Conclusions. Within the rectangular enclosure, a settlement thus existed at least at some time in the period 175 B.C. to A.D. 180. The enclosing stone wall was probably constructed in the period 175 B.C. – 115 A.D. (radiocarbon sample St 6607) or before.
2.3.9 Jorstorp

In the south-western part of the investigated area, phosphate mapping indicated settlement on a hill which today is surrounded by cultivated fields. In the 18th century, it formed a part of a remote meadow belonging to the Jorstorp farm in Bankekind parish. The hill has many areas of bare bedrock. Between the small rocks, there are passages and depressions. The high phosphate values are found where the ground is flat—in the northern and south-eastern parts of the hill. In the northern part, two slight scarps interpreted as house platforms, were found. No other indications of settlement can be seen, but on many places on the hill, stone-cleared surfaces, clearance heaps and short stone walls indicate prehistoric tilling. The two long, stone walls on the hill form, together with natural barriers, an almost complete enclosure around the hill, connecting with the house platforms in the north and open in the south, where it was connected with other stone walls. The stone walls barred animals from pasturing on the low-lying lands in the north and east. The hill thus formed a pasturing green of the same kind as that in Flåret 1.

Trench JA (7 m²). The trench was laid out at right angles to the upper house platform. Most of the trench covered the supposed house. Three different layers were identified. Layer A (see Fig. 2:43) was formed by a mixture of clay lenses and turfs and covered two different cultural layers (B and C). The layer with turfs and clay cannot have covered the cultural layers by natural processes and must therefore either have been put in place after the settlement was abandoned, which does not make sense, or have formed a part of a roof. Together with layers B and C, it covers the flat area between 0 and 350 and is bounded by the slight scarp at 400 to 500. The scarp is formed by an irregular row of stones and is best seen in the projected section. A fireplace was found between 0 and 160. It was lying directly on the bedrock, which had been partly shattered by the fire. Charcoal and burnt bones were found in the fireplace and at 40 there were numerous sherds, probably all emanating from one vessel. From this level in the fireplace, a charcoal sample was dated to A.D. 140±90 (140). At 200–240 in the section, a small hollow had been dug in the subsoil. Only a part of it was within the trench. In the bottom of the hollow, a lot of charcoal was found. The construction
Fig. 2:42. The house platforms at Jorstorp. From the W.

Fig. 2:43. Trench JA. Plan and projected section. The lower square of the plan is not included in the section. Scale 1:40.
Fig. 2:44. Settlement at Jorstorp. Scale 1: 1000.

may have been a post-hole, though it contained no stones. A charcoal sample was dated to A.D. 170±95 (165). The upper cultural layer (B) contained charcoal in small pieces and a collected sample was dated to A.D. 505±95 (485). This corresponds well to the find of a bronze fragment emanating from an equal-armed brooch dated to the early Vendel Period or to the transition between the Migration Period and the Vendel Period (Åberg 1953:137) in the same layer. Finds: Equal-armed brooch in bronze (fragment), pottery 770 g (whereof 751 g from one vessel), burnt clay 108 g and burnt bones 100 g.

Trench JB (1 m²). A small excavation was also carried out in the southern part of the hill. Burnt clay and pottery were found and charcoal samples were collected. No datings were performed.

Conclusion. The platforms in the northern part of the hill are the remnants of a settlement functionally connected with the stone walls. The radiocarbon dates indicated that the site was inhabited at least during the second and fifth/sixth centuries. The later period is also evidenced by a datable find.
2.3.10 Lövsveden II

This phosphate concentration covers a large area south of the present settlement of Lövsveden. It is a sandy area with many flat rocks. Three types of evidence of previous settlement and cultivation can be found in the area:

1. Some 20 mounds of split stone (skärvstenshögar) cover the area of high phosphate values. They are flat, often oval and 2–5 m long. They rest directly on the rocks and sometimes the stones form a layer rather than a mound. Areas with many mounds of this kind have often been dated in the Bronze Age and can generally be interpreted as settlement sites (Hyenstrand 1968, 1979:97 ff.). The close connection between the area with high phosphate values and the mounds supports this interpretation.

2. The stone walls in the area are of two kinds. The eastern wall (Lövsveden 14, probably continued by Lövsveden 6, 5, 4, and 3) forms an outer boundary, outside which few traces of cultivation can be found and it has been interpreted as a barrier enclosing the area west of the wall from outlying lands in the east. The stone walls west of that are generally narrower, many of them running on top of flat rocks but delimiting small areas of formerly cultivated land on the sandy parts down the hill. The evidence of cultivation consists of clearance heaps and short Lynchets, especially negative Lynchets on the upper limits of arable land. The stone walls of this later type may have served as barriers, but their main function was that of boundaries within the arable land. A short, double, stone wall (Lövsveden 19 and 20) may be the remains of a cattle path, but cannot be interpreted with certainty. Its running continues to the north by a sunken road and it may have been a connection between a site at the present farmstead and pastures in the south.

3. The third type of evidence in the area consists of the historically documented farm of Lövsveden and its fields. The name of the farm suggests a mediaeval or later origin. The fields documented on the 17th-century map are intermingled with the mounds of split stone and the stone walls but are clearly distinguishable from earlier fields. One of the stone walls (Lövsveden 21) served as a field boundary in the 17th century and later. Recent farming activities have destroyed and altered much of the earlier evidence, as is indicated by the stone heaps at the ends of stone walls. Parts of Lövsveden 8 have for
Fig. 2:46. The Lövsveden II area. For the location of trench LA (stone wall Lövsveden 15), see the main map (Fig. 2:3).
example, served as the boundary of a later field, as is indicated by the stones on top of the wall.

No settlement functionally connected with the stone walls can be identified. The most probable site would have been the present farmstead, where the possibilities of identifying it are, of course, few.

The excavations at Lövsveden were aimed at investigating the stratigraphy as between the stone walls and the mounds of split stone and at dating the outer barriers.

**Trench LA (4 m²).** The stone wall Lövsveden 15 (see Fig. 2:3) is only 30 m long and is not connected with any other walls in the area. Its function in relation to the system at Lövsveden is unclear. On the map of 1694, the area is shown as wet meadow and there were no fences in the same running as the wall. In 1975, the wall was only partly visible and I was made aware of it by Mr Gösta Junhammar, of Nybble. It runs in the present cultivated land and only the tops of some stones were visible. The trench was dug in order to investigate and date the original land surface under the wall, which was assumed to consist of organic soils. The excavation showed a narrow row of boulders, which cannot in its present form have served as a barrier. Small stones thrown in among the boulders had probably been cleared from the adjacent land. Judging from this, the function of the wall seems to have been that of a bank, which developed as the land was cleared. The largest stones rested on a thin layer of compressed, organic soil, which in a pollen analysis proved to contain large amounts of cereal pollen, including 13 per cent of rye (*Secale*) (calculated from the reduced AP-sum; see section 4.1). The ratios between *Betula*, *Pinus* and *Picea* also suggested that the pollen spectra belonged to historical times (a comparison was made with the diagrams from the nearby Vildmossen and Lake Flären; see sections 4.2 and 4.3). A radiocarbon dating of the soil showed that it was formed in A.D. 1365±90 (1390). The buried soil thus probably represents what was a wet meadow during early historical times. The stone wall was constructed as a boundary within the meadow, when the surface was cleared of stones.

**Trench LB (7 m²).** The trench was laid out at the stone wall Lövsveden 11, at a place where it runs across one of the mounds of split stone. The mound was a characteristic one among the mounds in the area (3.2 m in diameter and flat—only 20 cm above ground). Before excavation, the stratigraphy of the mound and wall was not clear. After removing the turf, only one stone in the wall was found in the trench. It was clearly superimposed on the mound, separated by a 5-cm-thick layer of soil, probably representing the turf layer developed on the mounds before the wall was constructed. This layer also contained small pieces of charcoal. On the northern part of the mound, larger stones were found and were interpreted as having been cleared from the arable land north of the wall. The mound consisted of stones 10–20 cm in size, most of them cracked by fire. The mound rested directly on the rock. Small pieces of charcoal and burnt clay were the only finds in the mound. Four soil samples from the mound had very high phosphate contents (265, 245, 210 and 265 P°). A profile of the phosphate values from the northern part of the trench is shown in the section on phosphate mapping (profile G in Fig. 2:7). The high phosphate values in the area should thus be regarded as a result of activities in connection with the mounds of split stone. As concerns the function of the wall, the breadth (only one stone) and the occurrence of stones north of the wall, apparently cleared from the arable land, suggest that it served only as a boundary within the arable land.

**Trench LC (4.5 m²).** Some 40 m further cast along
Fig. 2:48. Trench LB. Plan and projected section. Scale 1:40.

Fig. 2:49. Trench LC. Plan and projected section. Scale 1:40.

Fig. 2:50. Trench LD. Plan and projected section. Scale 1:40.
the same stone wall, a trench was dug with the intention of dating the wall. The wall is somewhat broader at this place, but there is a clear distinction between stones in the southern part being put into place one at a time, and firmly attached to each other and the lot of smaller stones in the north, which were probably subsequently cleared from arable lands. South of the wall, a compact layer of split stones and dark soil was found. The layer is connected with a mound of split stones less than 10 m from the wall. The dark layer continued under the stone wall but contained only scattered finds of stones. Charcoal from this layer was dated to 90 B.C. ± 130 (65 B.C.). Since the sample is collected from many scattered finds of charcoal, there is a certain risk of contamination from later charcoal, especially north of the wall, where the layer is not locked by stones. The result should accordingly be used with caution. It may show too late a date.

Trench LD (4 m²). In order to ascertain the
function and, if possible, the date of the stone wall Lövsveden 14, a trench was laid out across it. As can be seen from the section, this wall is much broader than Lövsveden 11 and may well have served as a barrier. The large stones are concentrated in the middle of the wall, and the small stones on both sides were probably situated on top of the larger ones. The stone wall was covered with a layer of peat mixed with pieces of charcoal. Charcoal from this layer was dated to A.D. 1600±125 (uncorrected). The charcoal probably represents an occasional burning of shrubs and twigs on the stone wall in historical times (cf. Sporrong 1981:42). The wall rested directly on a layer of clay. Charcoal sample St 5499 (A.D. 1315±205) was collected from two pieces of charcoal in the clay. They may represent the roots of trees burnt on the site and do not permit any conclusions to be drawn concerning the construction of the wall, since they lack any clear, stratigraphical position in relation to the wall.

**Trench LE (20 m²).** A mound of split stones just north of trench LB was investigated for the purpose of getting a more secure dating than that obtained from the layer in trench LC. Most of the stones were burnt and sharp-edged. Their sizes varied between 10 and 30 cm. Small, scattered pieces of charcoal were found on top of the mound and downwards, but no charcoal was found in a distinct layer. No datings were made because of the risk of downward movement of the charcoal in the mound. Finds: Small fragments of burnt clay.

**Conclusions.** Two trenches have clearly shown that the mounds of split stones in the area are older than the stone walls. Only one dating was made of the mounds, indicating a date in the first century B.C. The function of the mounds is unknown, but the phosphate values indicate settlement activities. The stone walls in the area have served different functions—Lövsveden 14 has served as a barrier, enclosing the lands west of it, while the other walls (especially Lövsveden 9 to 13) have served as boundaries within the arable land. No settlement contemporary with the stone walls has been found, but the density of the stone walls and their arrangement suggest that the area contained a settlement at this period. The most probable site is at the present farmstead.

### 2.3.11 Datings of settlements and stone walls: A summary

Of the seven investigated sites, five have shown clear evidence of settlement that may have been contemporary with the stone walls (Nygård III, Fläret I, Fläret II, Fläret III and Jorstorp). In one case (Nygård II), no settlement was found and at Lövsveden II, no settlement site contemporary with the stone walls was identified.

The trial trenches in the settlement produced a remarkably concentrated set of dates in the first two centuries A.D. (Fig. 2:52). Compared with previous research, which reckoned with a general period of settlement desertion during the fifth and sixth centuries (Lindquist 1968), the dates may seem early. If the settlements were abandoned for a fairly short period in the fifth and sixth centuries, one would expect later datings.

The early dates may to a certain extent reflect the excavation method, in which only small areas were uncovered and low-lying, undisturbed layers and fireplaces were preferred for the radiocarbon dating. A look at the locations of radiocarbon datings in the sections shows that very few dates originated in layers high in the stratigraphy. In one case (Jorstorp), a dating of a superficial occupation layer indicated later settlement. This was also supported by the find of a brooch dated in the fifth or sixth century. In two cases (trenches FC and FK) superficial finds of cheese-strainer sherds were made, a find which in the Halleby investigation characterised the last phase of settlement (cf. subsection 2.3.6).

In the cases of Jorstorp and Fläret I, where houses have been identified, it must thus be underlined that some of the radiocarbon dates may well belong to a period of settlement before the actual houses were constructed.

But it is also possible that the concentration of datings in the second century A.D. represents a peak in the number of settlements reached soon after the establishment of the new farming system. The decline in settlements may then have started as early as the third century A.D. As will be seen in Chapter 4, this possibility has some support in the pollen diagrams. The organisation of stone walls can then be seen as an outer framework, within which the number of settlements may have fluctuated.

As to the datings of the stone walls, indirect conclusions can be drawn from the fact that, in spite of phosphate mapping, detailed field surveys and test excavations, no settlement later than the sixth century has been found in connection with the stone walls. Eleven trenches have been laid over stone walls in order to achieve direct datings. In five cases, datable layers were found under the walls (trenches FE, LA, LC and NA). In only one case have dates later than the first century B.C. been achieved (LA).

In five cases, datable layers and constructions have been found overlying stone walls or in such positions that they would have been eroded if the wall had not prevented soil creep (FA, FJ, FL, LD...
and NG). In four of the trenches, datings in the period 100 B.C. to A.D. 300 have been achieved.

Of special interest is the dating of the stone walls forming the boundary around the greens at Fläret I and Fläret II and connecting the two sites with a cattle path. The stone wall Fläret B5 is underlaid by a fireplace dating from the third or fourth century B.C. and, according to the evidence from trench FJ, Fläret C21 was constructed during or before the third century A.D. This agrees well with the datings published by Nilsson in the period A.D. 200 to A.D. 500 (Nilsson 1976a; cf. subsection 1.2.5). As is indicated by the localisation of late-Iron-Age cemeteries in the Fläret area and is clearly evidenced by the fact that late-Iron-Age barrows in the Skärkind area are superimposed upon stone walls (cf. section 5.1), many of the stone walls had already lost their function during the late Iron Age.

2.3.12 Settlements and graves

The large number of prehistoric graves of various forms in the Fläret area has purposely been kept out of the discussion on possible settlement locations and their dating. There are few regions in Sweden which can show such an abundance of contemporary settlements and graves as the eastern part of Östergötland. On Gotland, where the house foundations dating from the Roman Iron Age and the Migration Period are easily identifiable, the contemporary graves are generally missing. In the Mälar area (Uppland, Södermanland, Närke and Västmanland), where the cemeteries have been much used for settlement studies (Ambrosiani 1964, Fernius 1971, Hyenstrand 1974, Welinder 1974 and others), we still lack an analysis of the abandoned settlements and stone walls. There are thus few Swedish examples on which to base an analysis of the relation between settlements and graves during the early Iron Age. The very close relation between cemeteries and hamlets which is indicated during the late Iron Age cannot be uncritically assumed for the early Iron Age.

Experience of the extensive rescue excavations during the 1950's and 1960's formed a basis for dating graves from their morphology. For Uppland and Södermanland, this basis has been summarized by Ambrosiani (1964). On this basis and on the excavations and surveys carried out in Östergötland (see, for example, Damell 1976 and Nilsson 1978), Selinge has grouped the graves and cemetery types in Östergötland according to their ages:

![Fig. 2.52. Radiocarbon datings from settlements in the Fläret area. In Table 7 (p. 126) all radiocarbon dates from the Fläret area are listed.](image-url)
Fig. 2:53. Settlements and cemeteries in the Fläret area. Scale 1:12 500.
I. Single graves. To this category belong cairns (rösen) and stone settings (stensättningar), with no other material than stones. They are often irregularly dispersed on crests of hills and sometimes gathered in small groups. The material and the distribution date them to the late Bronze Age or, in some cases, the early Iron Age. These graves are characterised by their quadrangular form or by a central cairn or boulder (mittröse eller mittblock).

II. Cemeteries of the early type, mainly dating from the early Iron Age. Cemeteries of this type have a rich variety of grave types with standing stones and circular, quadrangular or triangular stone-settings. The circular stone-settings often have central cairns or boulders. A large proportion of large, flat stone-settings in a cemetery must be considered as an indication of the early type.

III. Cemeteries of the late type, dating mainly from the late Iron Age. To this category belong mounds (högar) and circular stone-settings covered with turf (runda övertorvade stensättningar). Triangular stone-settings with curved sides (treuddar) and boat-shaped stone-settings (skeppsformiga stensättningar) may also be represented. Cemeteries only consisting of stone-settings can be categorised on the basis of the diameter and form of the stone-settings. A small diameter and the shape of an inverted bowl (välvd) argue in favour of category III.

(Abbreviated translation from Selinge et al. 1976:24-27)

The graves and cemeteries of the different categories have been mapped in the Fläret area (see Fig. 2:53). Close to the settlements dating from the first two centuries A.D., there are always graves or cemeteries of the early type, but there is no simple relation between farms and graves during the period. Besides the graves close to settlements, there is also a large number of loosely grouped or isolated single graves, which lack a direct connection with a settlement. Among these are some that may be of Bronze-Age or Pre-Roman origin, but also many that can be dated with great certainty to the period 0 to A.D. 400 (flacka stensättningar med mittröse; cf. Nilsson 1978:109-110).

During the late Iron Age, the conditions are different. Graves of the late type (högar, högliknande stensättningar) are concentrated in three cemeteries, which are all situated within 300-400 m of the historical hamlets of Fläret and Öjeby-Ojbytorp and in direct connection with their oldest-documentated, arable land (early 18th century).

While the single graves and the cemeteries of the early type are dispersed over the whole area—often, but not always, in connection with early-Iron-Age settlement sites—the late type of cemetery is situated close to the historically known settlement. If the dating of the cemetery can be used to date the settlement, this would indicate that the late-Iron-Age settlement and fields had the same location as the historical and that the stone walls had at this time already lost their function.

2.4 Settlement and land use in the Fläret area: A summary

The period 100 B.C. to 600 A.D. forms the wide, chronological frame within which the pattern of settlement and fields depicted on the map (Fig. 2:54) emerged, developed and probably also lost its function. The settlement sites originated before the birth of Christ (Fläret I, Fläret III), while direct, stratigraphical datings of the long stone walls as yet point to the third century A.D. The obvious impossibility of dating every element in the pattern limits the possibility of establishing a cross-sectional reconstruction of the pattern at a certain point of time. Metachronous phenomena no doubt exist within the area—the boundary between infield and outlying lands may have changed and the number and localisation of the settlements may have varied. It is reasonable to assume that the last part or the culmination of the expansion period left the most distinct traces (Welinder 1977:189).

The findings in this chapter are summarised in the map (Fig. 2:54) It shows the division of land between inägor (enclosed land) and utmark (pasture), based on section 2.2 and settlements dated in the period 100 B.C. to A.D. 600 (section 2.3). The traces of cultivation marked on the map are not to be understood as a reconstruction of all the arable land during the period studied. Much of the evidence of prehistoric cultivation has been destroyed by later cultivation. The cross-hatched areas on the map only show the occurrence of positive evidence of tilling in the form of low stone walls (begränsningar), negative or positive lynchets and/or surfaces cleared of stones.

At least during the second and third centuries A.D., the number of settlements in the area was four or five. They were knit together by a common system of stone walls and formed a village-like type of organisation. The settlements were situated on the boundaries between infield and pasture or were connected with the pasture by a cattle path. To judge from the possible areas, they consisted of single farmssteads. The Halleby site, with its hamlet type of settlement (Lindquist 1968), is in that respect unique. Most settlements in the Fläret area had only half the area of one of the assumed building lots in Halleby. The recently excavated settlement at Fägelberg and Fälåsa, Rappestad, is perhaps more typical of the settlements dating from the period 0 to A.D. 400, with its two houses measuring maximally 5 × 14 m and 6 × 25 m (Arkeologi i Sverige 1977:65-66).

The majority of the stone walls served as barriers between the inägor and the utmark. This division of the land into two categories—which closely follows the differences in soil texture—is the skeleton around
Fig. 2.54. Reconstruction of settlement and land use in the Flåret area during the early Iron Age (c. 100 B.C. to 600 A.D.). Scale 1:12 500.
which settlement and land use have developed. The boundary depicted on the map represents the maximum extension of the infield during the period studied. Other stone walls with probable functions as barriers can be found inside the enclosed area (for example, Nygård 10, 11 and 12; Lövsveden 7 and 8; Fläret E 8). In some cases, they may indicate a gradual extension of the enclosed lands, in others the existence of separate pasture areas on the infield.

The land use on the infield was to a large extent restricted by the level of the ground-water table. The lower limit of prehistoric cultivation cannot be documented today, because of late cultivation, but if the water table during the early Iron Age was not considerably lower than during the 19th century, only the lands above the 70-m contour could have been tilled. This boundary roughly corresponds to the boundary between the clay and the washed-out, sandy soils around the hills. Traces of early cultivation have been found around each settlement site. The area of arable land attached to each settlement was not large. To judge from the soil texture and the probable level of the water table, the total cultivable land around each site may have amounted to between 2 and 10 ha. The close association between farmsteads and fields and the rather small area indicate that the fields were intensively tilled. Two important indications of the use of manure can be gathered from the field evidence.

The first is the distribution of phosphorus around the settlement of Fläret I, a distribution which seems to coincide with finds of abraded pieces of pottery (see subsection 2.3.6). A similar distribution of phosphorus—though smaller—can be seen around Fläret II and Jorstorp. At Nygård III, the phosphorus values are low and at Fläret III and Lövsveden II the high values may have other causes (late fertilizing and previous settlement respectively).

The second indication of the use of manure is the existence of cattle paths. As is shown by Lindgren, this feature exists only in areas where the cattle are daily driven to the farmstead (Lindgren 1939:145). Either the use of manure underlies this organisation of the stone walls or else it was probably an intimately related product of the spatial organisation.

Below the 70-m contour, the lands were, until the drainings around the turn of the century, used only as wet or moist hay-meadows. The fact that the enclosed infield contains such large areas of this type of land can only mean that the wetlands were used for producing winter fodder even in the early Iron Age. If the stone walls were only designed to bar livestock from the arable land, the long stone walls would not have been needed. (The use of the wetlands in the Fläret area is further treated in section 4.3.)

The agrarian landscape in the Fläret area during the period A.D. 100 to A.D. 500 can thus be characterised as consisting of dispersed, single farmsteads within a village-like type of organisation. The fields were probably intensively tilled and the greater part of the inägor was used as enclosed hay meadows.
3 THE FARMING SYSTEM

3.1 Historically documented, infield systems

In the first chapter, the similarity between the stone-wall localities in Östergötland and the historically documented ensäde farms and villages in Sweden was pointed out. The clear distinction between inägor and utmark, the settlement form of single farmsteads or groups of farms knit together by a common barrier or head-dyke to the utmark and the lack of internal boundaries within the infield are features common to these types of farms and villages.

Such farming systems have unfortunately been termed infield-outfield systems by some Scandinavian authors (Christiansen 1978, Myhre 1978, Welinder 1975), using the term in a very broad sense to mean a farming system "utilizing its area at two different levels of intensity: an intensively farmed infield and an outfield exploited at a low intensity" (Christiansen 1978). In the English terminology, the term has been restricted to systems of land use "whereby the infield was manured and grew crops continuously, and the outfield was cultivated in temporary breaks" (Adams 1976:155; see also Uhlig 1961:287). In such a system, one usually finds three levels of exploitation: infield (cropped annually), outfield (shifting cultivation) and common grazings. Such infield-outfield systems have been documented in many European countries (Uhlig 1961, Dodgshon 1978, 1980, and others) and have many parallels with the ensäde system documented in many Swedish provinces in the 17th century, although in Sweden the infield in most cases included a large proportion of meadowland—an infield system with enclosed meadows.

Most of the writing on Swedish 17th- and 18th-century farming systems is based on the spatial expression of the farming systems—the organisation of fencing—while the actual cropping pattern is usually little discussed. The often very close connection between the cropping pattern and the organisation of fencing has thus blurred the definition of the term odlingssystem. According to Dahl, the term is confined to the spatial characteristics of the system. The terms ensäde, tvåskifte and treskifte only describe the number of years a certain field was protected by fences from grazing animals during the summer season, not how often it was sown (Dahl 1942:110). The actual cropping pattern within a field may accordingly vary within the same type of odlingssystem. In the ensäde, the whole infield is closed every year, while the crop rotation may vary from yearly sowings to regular or irregular, fallow periods. The ratio of meadow to arable land in the infield may vary as well, but the common feature of most Swedish ensäde systems was the interdependence of arable farming and cattle-breeding, and thus a large part of the infield was devoted to haymaking, unless the winter fodder—as in many parts of northern Sweden—was mainly collected on outlying, wet meadows (cf., for example, Enequist 1937).

Basing his research on documentary evidence of the actual rotation of crops in the early 19th century, Lägnert uses the same terms to denote how many years the field was sown, ensäde meaning that all of the arable land was in cultivation every year (1955:10). Göransson uses the terms gärdessystem (the spatial layout of fences and fields) and trädessystem (fallow system, rotation) to describe these two different characteristics of the farming system (Göransson 1961:277). The following hierarchy of definitions can thus be identified:

![Diagram of farming system]

FARMING SYSTEM

ODLINGSSYSTEM

GÄRDESSYSTEM

TRÄDESSYSTEM

THE ROLE OF ANIMALS

DEGREE OF SELF-SUSTENANCE

WATER SUPPLY

IMPLEMENT

(Cf. Ruthenberg 1971)
The deduction from gårdssystem—which is the part of the farming system that can be documented in a fossil landscape—to trädessystem and farming system involves a certain risk of circularity, since similar forms may be the outcome of very different processes (cf. Baker & Butlin 1973:628, Norton 1982).

Bearing in mind the difference in age, in forms of tenure and in social organisation, the vast collection of 17th- and 18th-century maps in Sweden may still serve as a reference for classifying early farming systems, as regards the kind of gårdssystem they represent. From the historical examples, the different trädessystem and other farming practices usually associated with a particular, spatial organisation can be depicted. Four examples relating to the following interpretation will be given below.

Vilske härad, Västergötland 1640 (Lindgren 1939)
On a limestone plateau west of the Mösseberg hill, a large area of inägor was located (see Fig. 3:1). It was bounded on the western side by the limestone scarp and on the eastern by the foot of the hill. Along a common fence, six villages and several single farmsteads were joined together to form a very large gårdeslag. The total length of this infield area is almost 15 km and after the corn was reaped, cattle could move freely on the infields belonging to four different parishes. The average area of arable land attached to each farm was 4.5 ha. It was sown every year, barley being the main crop. Small parts of the arable land were taken out of cultivation irregularly to recover. Land in such a fallow stage (called äkra) amounted to some 5 per cent of the arable. There
were 15–20 ha of meadowland to each farm. The maintenance of fences around the infield was a common interest of all the villages and farms, and conflicts concerning it were regulated at the häradsrätten (the jurisdictional area covering several parishes).

Rösa, Berg, Torp, Skede parish, Småland 1645 (Erixon 1960)
The map includes six farms functionally connected to a common system of fences (Fig. 3:2). They are situated 5 km north-east of Vetlanda in the southern Swedish uplands, above the marine limit, where silty soils often cover the tops of the hills. The common infield is situated on a slope with the northernmost farms some 30 m above the River Emån. The arable fields are concentrated in the vicinity of each farm, but there is a certain amount of mixing. There are internal fences in the infield, and most farms have their lands in more than two different enclosures. The fences are, however, not adjusted to any regular type of fallowing and in the description the farms are said to practise ensäde. The six farms might have developed from three original farms, judging from the way in which their parcels are intermingled. All the farms have a direct connection with the pasture along a cattle path. The size of the arable land varies between 2 and 6 ha and the meadow area is about 20 ha per farm.

Viks ödegärde, Klövedal parish, Bohuslän 1699 (LMV., Klövedal 28:2; Olsson (ed.), forthcoming)
This single farm is situated in the archipelago on the west coast of Sweden (Fig. 3:3). The physical landscape is dominated by bare bedrock, split up into small fissure valleys with fine sediments. The climate permits of late autumn and sometimes winter pasturing on the heaths covering the rocks. The infield of the farm is situated in the valley and is bounded by rock-faces, supplemented with stone walls. A separately enclosed, cow pasture is situated in an adjoining valley. The arable land (1.7 ha) was sown annually in a rotation including beans and peas, while a small part of it (0.2 ha) termed ödesåker (deserted field) lay fallow, a common practice in the province. The meadowland amounted to 9.7 ha.

Kristdala parish, Småland, 1650 to 1850 (Aronsson 1979, 1980)
Basing his research on early, large-scale maps and their accompanying descriptions, supplemented with contemporary literature, court books and probate inventories, Aronsson has made a scheme of
land use and types of land in a woodland district in south-eastern Småland (Fig. 3:4). Behind the apparently very stable system documented on maps of ensäde villages, the supplementary sources reveal great flexibility and many different ways of coping with the general problem of restoring nutrients to the soil. Lands within the inäga could easily be converted to other types of land use. The arable land (ensädesåker), which was mainly dependent on heavy manuring, was fallowed irregularly (oregelbunden träda). On poor soils, it could be fallowed for a long time and used for pasture and mowing (linda). To improve the meadow, small parts of it could be cultivated and sown with corn for a couple of years (svalåkrar). Meadows could be left to revert to woodland (skogsträda) for some years to improve the production. The woodlands on the utmark were used for pasturing but were also used for many other types of cultivation, of which the slash-and-burn rotation (svedjebruk) was the most important. The fields cleared by fire could be converted to permanent pastures (hagskog) or arable land (bestående lyckodling). Up to the middle of the 18th century, the proportion of arable to meadow to pasture land often was 1:8:20.

Though dissimilar in form, the four examples are based on similar farming systems. The arable land is small (1.5–6 ha) and the restoration of nutrients is mainly based on manuring—only small proportions of the arable land are fallowed in an irregular pattern. The major part of the infield was used for haymaking (four to eight times the arable land in size). Within the framework imposed by the boundary between inägor and utmark, many different ways of improving grasslands may have existed. A common feature of the examples and of most parts of Sweden where ensäde was practised were the vast, natural pastures in woodlands or heaths. The differences in form represent adjustments to different environments, in which the isolated farm Viks ödégärde represents the one extreme, bordered on all sides by bare bedrock with heather vegetation. Outside the clay valley, no cultivation was possible. In Vilske härad, the same type of farming system developed into large-scale co-operation between the farms and villages on the limestone plain.
3.2 A model of farming systems and land use

The relationship between the farming system, the physical landscape and the land use can be schematically illustrated by the following model:

![Diagram of farming system model](image)

Which farming system was employed within an area may be said to have been determined mainly by the following factors: the population size in relation to the available land area, the known technology (including the knowledge of manuring and following systems) and the physical prerequisites for different farming systems. When the farming system and the settlement forms are given, there are, within any specific physical landscape, a limited number of ways in which to organize land use. The importance of distance is shown in the circular arrangements of land use in the examples above, with the arable land, the meadowlands and the pasture at increasing distances from the farmstead.

The three factors farming system, physical landscape and distance were operationalized and used to simulate the structures which a certain farming system might have developed within the physical landscape of eastern Östergötland. The aim was to provide the answers to the following questions:

1. Given the physical landscape in the Fläret area, what land-use pattern and system of barriers would an infield and meadow system lead to?
2. What was the maximum number of farms that was able to exist within the area during the early Iron Age?

In a tentative model, farming systems have primarily to be expressed in areas of different land use in each settlement. In this operationalizing procedure, a number of assumptions have to be made. For example, the role played by surplus production has been assumed to be of minor importance and the calculation of calorific needs has been made on the basis of subsistence agriculture. The transformation also requires assumptions about the population per settlement unit, calorie intake, yield ratio, size of cattle herd or sheep flock, production from the meadows, etc. Some of these variables can be given values with some accuracy, while others can be given only very hypothetical values. The test may, however, be repeated and continual re-evaluation of the variables is possible.

It has so far been assumed that the social structure during the period of study was based on the family. But, within the framework of that concept, there is the possibility of different interpretations of the number of individuals. Hagen has presupposed that Migration-Period farms in Norway would have been inhabited by an extended family with three generations or 20–30 individuals (Hagen 1953:157 ff.), while for the same period Odner assumes a family of two adults and three children on a specialized mountain site in Norway (Odner 1972:629). More exact estimates, based on functional analyses of excavated farms, are still rare in Scandinavia, but the analysis by Myhre points to lower populations on each farm in south-western Norway than was previously thought (Myhre 1980:326). The relations between farm, holding and household have, however, varied within Scandinavia and the discussion also suffers from linguistic problems (cf. Ambrosiani 1974). Edgren and Herschend—partly influenced by an earlier version of this section (Widgren 1979a)—found that a farm population of eight to ten individuals, divided between two households, was a reasonable estimate on Öland during the same period (Edgren & Herschend 1982). In his estimations of food production during the third century A.D. in western Germany, Abel calculated a family size of six Vollpersonen (that is to say, eight to ten individuals) and this estimate has been used in the following calculations (Abel 1962:23).

Area per settlement unit

The areas of different land-use types needed, in order to support a given number of individuals, can be calculated fairly accurately from the known relationships of later times. The problem has been treated by, among others, Abel (1962) and Hannerberg (1971). What follows will be based mainly on Hannerberg, who in his work summarized the findings of historical and geographical research on production and consumption in the period A.D. 700–1900. The required area, often considered by other authors to be 3 ha for a Migration-Period farm (Hannerberg 1971:87), can with a yield ratio of 3.5 be calculated as having produced a surplus for consumption of 1500 kg of cereals (seed 200 kg/ha, yield 3.5 x 200 kg/ha). This would equal 2190 kcal per adult per day (1 kg of cereals=3200 kcal, 1500 x 3200/365 x 6). The remaining, approximately 1000 kcal were provided by animal products. Hannerberg shows that a stock of 9.5 “units of livestock” (4–5 milk cows, 2 heifers, 2 oxen, 3 pigs, 10 sheep and some goats) would have produced 1 100 000 kcal of meat and milk a year (p. 107). The need for manure in an infield system would,
however, require a larger stock than Hannerberg has assumed in his example from the 17th century. In Norwegian infield areas, one cow is said to manure between 0.1 and 0.3 ha (Hagen 1953:149). In this example, a herd of between 10 and 30 cows would have been needed. If we instead assume a herd of 15 “units of livestock”, the energy production of meat and milk will be 1 700 000 per year or about 880 kcal per adult per day. This would leave about 200 kcal to be produced by hunting, gathering and fishing, in order to reach a daily need of 3200 kcal.

In order to support such a number of livestock on winter fodder for about 200 days, 15 000 kg of hay would be needed. The production from meadows in this part of Sweden in the 17th century was c. 500 kg of grass and sedge per hectare (Wennberg 1947:66).

These calculations suggest that an area of 3 ha of arable land and about 30 ha of meadow land would have been required. Since the pasture is assumed to have been located on the less productive grasslands and in the woods, an area of pasture of at least the same size as the meadow land would be needed. Evidence from similar systems in historical times suggest that the pasture area would be twice as large as the meadow (Aronsson 1979, Asheim 1978:14). Thirty ha for pasture land should probably be regarded as a minimum figure, corresponding to the pasture close to the farmsteads. The relations between areas of different land use, production and consumption on an early-Iron-Age farm in Östergötland can hypothetically be described as in Table 1. The hypothetical nature of the figures must be emphasized, since at this stage none of them has been verified from field evidence in Östergötland.

The physical landscape
A simplified, soil map of the Fläret area has been stored on magnetic tape in the form of a matrix in which each cell represents a surface of 40 x 40 m. The actual distribution of soil textures within the area (cf. Fig. 2.2) has, in that way, been used as a playing-board for the simulation model.

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area (ha)</th>
<th>Production (kg)</th>
<th>Calorie content (kcal/kg)</th>
<th>Total calorie production (kcal)</th>
<th>Calorie consumption per day and adult (kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arable</td>
<td>3</td>
<td>1,500</td>
<td>3,200</td>
<td>4,800,000</td>
<td>2,190</td>
</tr>
<tr>
<td>Meadow</td>
<td>30</td>
<td></td>
<td></td>
<td>6,000</td>
<td>275</td>
</tr>
<tr>
<td>Pasture</td>
<td>&gt; 30</td>
<td>300</td>
<td>2,800</td>
<td>1,120,000</td>
<td>510</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hunting, fishing</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Daily need</td>
<td>3,200</td>
</tr>
</tbody>
</table>
Fig. 3.5. Result of the simulation, with soil differences not taken into account. Scale 1:20 000.

Fig. 3.6. One of the outcomes of the simulation, with soil differences taken into account. Scale 1:20 000.
character and all include small, sandy areas suitable for cultivation. In addition, there are numerous small pools of water and springs within the area. In a model, therefore, the exact location of settlement on one of these mounds can be seen as occurring randomly. As a first step in the simulation, one settlement site has been randomly located on till or bedrock. To the settlement have then been assigned fields, meadows and pasture in the proportions indicated above.

The model has been run until a new settlement could not meet its need for land within the test area (4 km²) or until a new farm had to cross the lands of more than one other farm to reach its own arable or pasture land.

Since only 45 per cent of the study area consists of till or bedrock, the location of settlements will very closely resemble the actual pattern of settlements, past or present. Five of the six farmsteads will be located at a distance of less than 300 m from a prehistoric or historic settlement site.

The average distance between settlements is, in the simulation model, somewhat greater than that between the recorded, early-Iron-Age settlements. In the model, pasture land occupied by one farm could not be placed at the disposal of another farm for settlements or fields in a later stage of the simulation. This corresponds to a "landnam situation"—a colonization of virgin land, in which each settlement claims its own territory and no cooperation takes place between settlements. There are, however, serious doubts about whether the early-Iron-Age settlement in the investigated area was a result of this kind of colonization. Pollen diagrams and burial cairns indicate a continuous occupation since at least the beginning of the Bronze Age. The establishment of the early-Iron-Age farms is to be seen more as a change in agrarian and social organisation than as a consequence of colonisation. A change of the rules for the simulation would probably develop a pattern of settlement closer to a random distribution.

In all, 5–6 settlements can be located theoretically within the test area. Research in the field has recorded five dwelling sites dated to the early Iron Age in connection with the system of stone walls (section 2.4). If they can all be shown to be contemporaneous, then the assumed area of 33 ha of enclosed land to each settlement is verified. As far as concerns the areas of different land-use categories associated with each settlement, the empirical pattern could thus have been the result of the assumptions underlying the model.

A closer comparison between the actual land use and the pattern produced by the simulation must be based on an analysis of the system of barriers. It can easily be reconstructed by noting the land use. It has been assumed that co-operation took place between the settlement units in order to minimise work on the stone walls. The barriers thus mainly separate different types of land use, not land belonging to different settlements. For some settlements, cattle paths are needed, so that they may be directly connected with the pasture lands. This corresponds well with the empirical relationships actually observed. Both in the model and in reality, the stone walls often separate the till from the clay. Parts of the clay are, however, used for pasture. This explains why some of the walls cross the clay plains in order to separate meadow from pasture.

Although the basic idea of the farming system seems to have been the same, the resulting pattern of land use thus agrees with neither of the examples from the 17th century given above (see section 3.1). The large areas of potential meadow land in eastern Östergötland allowed of a much more complex pattern than the isolated, Viks ödegärde type of infields, while the many small hills on the clay plain prevented the very large, common infields of the Vilske type from developing. The boundaries between infield and outlying lands in Östergötland are to a lesser degree given by nature. In that type of landscape, co-operation in the maintenance of the barriers separating the infields from the common pastures seems very natural.

The initial assumptions about the farming system may thus very well explain the emergence of the prehistoric stone walls in the area studied. But it has not been shown that this farming system is the only one that might have developed into the observed pattern. Modelling has emphasized the connection between a functional system and the forms it has developed, but inferences in the other direction—from form to functional system and process—can only be hypothetical.
3.3 Stability and change in infield systems

The key to all types of farming systems is their ability to replace the nutrients drawn from the soil. Knowledge of the forms of soil improvement is therefore crucial if we wish to explain a particular farming system—its stability and its possibilities of development. In most self-sustaining, farming systems in Europe, the main weak link is the supply of nitrogen. Since only a few of the crops are able to fix nitrogen, the two main ways of restoring nitrogen are fallow periods and controlled flows of nitrogen from one type of land use to another, usually with the livestock acting as nitrogen catchers on pasture lands and their manure being spread on the fields. The stability of the farming system must thus be explained in ecological terms—as flows of energy and nutrients between the elements in the system (cf. Frissel 1977), while changes in the flows of energy and nutrients will involve social factors—whether landholding, common maintenance of fences or changed need for manpower. The possibilities of development are therefore dependent on the social and territorial organisation.

Infield systems are usually established with low capital inputs (Christiansen 1978). The fences are short, compared with those in systems adjusted to regular, fallow periods, and the tilled area is small. In an early stage of its development, an infield system is usually expansive, since a small increase in fertility and thus yield/seed ratio will result in a large increase in net yield (see the formulas given by Christiansen 1978:2 and Slicher van Bath 1963:19 ff). It is therefore natural to find infield systems in the early stages of permanent farming. While the earliest infield systems in Scandinavia were established in the first few centuries A.D., many examples of fairly late establishment can be given (see, for example, Bodvall 1959:205).

The flows of matter in an infield system consisting of the elements documented in the Fläret area are shown in Fig. 3:7. The breadths of the arrows only indicate the relative importance of the flows (based on the table in section 3.2 and Enckell et al. 1979, Kaland 1979 and Rasmussen & Renberg 1980). The main flows—measured as energy—are those from the meadow land and the pastures to the livestock. Compared with the inflow of energy to the livestock, the output of energy available for consumption is less than 10 per cent (Welinder 1975:29). The collection of fodder in the meadow, consumed by stalled animals during winter, produces a net flow of nutrients from the meadow to the arable land, when the dung is spread. If the animals were kept in night pastures near the farmsteads—as the cattle paths and stone walls indicate—a flow from the pasture during the summer would also be possible. This flow of nutrients from the grasslands to the arable land is the key link in the system.

If the relation between cattle-breeding and arable farming was kept in balance and the grasslands for pasture and winter fodder were large enough for over-exploitation not to occur, the farming system could probably have endured much longer. But, unlike the areas where similar farming systems were operating up to our own time, the physical landscape in Östergötland evidently permitted a larger production. In a long-term perspective, it is thus not surprising that this farming system in Östergötland was only one step in the development and that in the long run it had to be replaced by a more efficient one.

The possibilities of development

In spite of the small area of the arable land, the products obtained from it probably played a major role in consumption in the infield system. The possibilities of increased food production within a given area are also totally dependent on increased production on the arable land. The following possibilities of development of the farming system can be discussed:

Increased manuring. As long as there is a nitrogen deficiency in the arable land, increased manuring will result in increased yield. Some figures on the effects of increased manuring are given by Christiansen, showing that the carrying capacity of a field would be doubled if manured with dung from 2.5 extra head of cattle. In systems with low yield/seed ratios, even a small increase in fertility will result in a high percentual increase in cereals for consumption (Christiansen 1978, Slicher van Bath 1963). Increased manuring may be achieved by the more efficient use of the dung from the same number of cattle or by increasing the number of cattle. The latter presupposes that sufficient areas for pasture and collecting winter fodder are available.

Increasing the arable land in the infield. The increase of cultivated fields in the infield would only result in increased production if it could be done without decreasing the areas for winter fodder or if it were combined with the introduction of regular, fallow periods (see below).

If the first two possibilities of development are already fully used, a restructuring of the system by adding new elements would be needed:

Regular fallow. The introduction of two- or three-field systems will usually demand an increase in the cultivated area by 100 or 50 per cent respectively, if the yearly sown area is to be the same (Hannerberg 1971:18). The full benefits of regular, fallow systems will only be achieved if the fallow can
be used for pasturing, which will usually demand a total re-arrangement of the system of barriers.

Cultivation on the utmark. Shifting cultivation by the slash-and-burn method has been historically documented in many places in Sweden as a complement to an infield system (see the Kristdala example in section 3.1). The infield-outfield system, as described by Uhlig, Dodgshon and others (see section 3.1), with an outfield cropped in temporary breaks and dependent on the tethering of animals for its manuring, represents another possible development, which would increase the total product.

The levels of decision-making
The forms of landholding and tenure during the early Iron Age are not known, but in similar farming systems, in which a clear boundary existed between inägor and utmark and many farms had a share in the same infield, three distinct levels of decision with significance for the development of the system can be identified. The spatial correspondence between farmstead and cultivated fields suggests that the individual farm formed the basic unit, with a private usufruct of the arable land. Assuming that livestock also were held individually, the farm had a certain control of the flows of energy and nutrients between livestock and farm and arable land.

Since the farms were knit together by a common system of stone walls, the “enclosure society” (hägnadslag) must have played a central role in the farming practices (Erixon 1962). The maintenance of fences and the use of the infield were regulated through this society. The Swedish mediaeval laws give clear evidence of the central role played by fences in the local community. Even if the maintenance of the fences was shared between farms, the work was of a clearly social character, since the production on all the farms was dependent on it (Myrdal 1977). Even where the arable land and the meadow were owned privately, the members of the hägnadslag exercised a common right of pasture over the infield after the harvest. The private usufruct was restricted to the period between sowing and harvesting (Lindgren 1939:157, Brandt & Rasmussen 1976:50, Dodgshon 1975:143). Changes of land use within the infield, such as converting meadow to arable land, must also have been regulated within this society.
The rights of common grazing on the waste represent a third territorial level in an agrarian landscape in which an infield system with common grazing was practised. In the central part of eastern Östergötland, the unenclosed areas were few and from the number of cattle paths running to some of them, one may conclude that many farms were dependent on them for grazing (see, for example, the large utmark area SE. of Törnevalla, sheets 8G5a and 8G5b of the 1981 version of the economic map). Their use must have been regulated by an organisation at a higher level than the "enclosure societies". Regulations at this level can, for example, be found in the oldest, written document on the Faroe Islands (Brandt & Rasmussen 1976:49). The regulations within the "enclosure society" and within the higher organisation exercising the rights over the common pastures were of vital importance for the ecological stability of the farming system.

The balance between the size of the arable land and the number of animals on a farm, so crucial to the stability of the farming system, can thus only to a certain extent be decided upon at the farm level. A complex interdependence between farm and society forms the framework within which the possibilities of development of the farming system must be judged, since the main flows of energy and nutrients were dependent on regulations above the farm level.

On the one hand, a local endeavour to increase production can be seen as the driving force (whether this was caused by population pressure or not will not be discussed here). The system of closely related farmsteads knit together by a common system of stone walls might at one stage have hampered the introduction of new farming practices. The signs of crisis contemporaneous with the dissolution of the farming system may then be seen as having been caused by a contradiction between a local endeavour to develop agrarian technology and the inertia of the existing spatial and social structure.

On the other hand, it is possible to see social changes as the cause of the crisis. Since the ecological stability of the farming system was so dependent on regulations at higher levels, it may—in its special form in Östergötland—have been a product of a specific type of social organisation. The crisis can then be regarded as an effect of a breakdown of this social organisation. Decreased authority among the organisations controlling the common pastures may lead to over-exploitation and disturbances in production (cf. the discussion referred to in subsection 1.1.3).

In practice, these two directions of influence—from production to social systems and from social systems to production may well have operated simultaneously.
4 VEGETATIONAL CHANGE

4.1 Introduction

The fossil forms in the landscape yield little evidence as to the actual development of the farming system during the late Iron Age. The continual description of changes in the vegetation which pollen analysis can provide us with is therefore one of the few ways of connecting our knowledge of the early-Iron-Age landscape with the much-better-known, historical landscape in the area (cf. Chapter 5). Not only the intensity of land use, but in some cases also changes in the relation between different land-use categories and thus the forms of land use may be measured.

In the first chapter, it was hypothesized that the successive establishment of farms during the early Iron Age led to an over-exploitation of the land. This can be seen absolutely, as a high degree of exploitation of the land, but also in connection with the farming system, as a disturbance in the relation between arable farming and cattle-breeding.

The aim of this chapter is thus to provide a measure of the relative intensity of land use and of the relation between arable farming and cattle-breeding over time.

The aim of this chapter is thus to provide a measure of the relative intensity of land use and of the relation between arable farming and cattle-breeding over time. Previous pollen-analytical studies in Östergötland covering the actual period have been concentrated in the plains in the western part of the province (Helmfrid 1958, Magnusson 1964, Norrman & Königsson 1972, Göransson's ongoing research; see also Königsson 1971) and in the southern woodlands (Göransson 1973, 1976, 1977). On the plain south of Lake Roxen, no modern pollen analyses have been carried out (the work by Öster (1947) is incorrectly dated and contains few determined herb pollen).

Two pollen diagrams have been worked out in the Fläret area. The aim of the diagram from Lake Flären (section 4.2) is to describe vegetational development in the region. From the size of the lake, we can assume the area described by the diagram to be of the order of 1000 km² (cf. Berglund 1979:20), thus covering a large part of the Roxen plain, perhaps with a bias towards the more marginal lands in the south. The region covered is homogeneous as regards both the physical landscape and the past and present agrarian landscape, with extensive remains of early-Iron-Age agriculture.

The aim of the Vildmossen diagram (section 4.3) is to describe the state of the enclosed wetlands in the Fläret area during the period 100 B.C. to A.D. 500 (cf. section 2.4) and to describe the local vegetational development in an area close to the settlement.

The analyses have been carried out at the Department of Quaternary Geology, University of Uppsala. The samples were treated by the acetylsis method (Fægri & Iversen 1975:107). Samples with high contents of minerogenic material were left in hydrofluoric acid for about 24 hours without heating. The determinations from Lake Flären were carried out by the author and the Vildmossen diagram was determined by Ivan Lundvall. The limit of the large graminids (Cerealea) was drawn at 40 μ. The determinations of Secale were made from both size and morphological features (Beug 1961).

The diagrams are divided into the following sections:

AP diagram (A)
The section includes all trees and bushes. The basis for the calculation is the sum of all arboreal pollen, including Juniperus and Corylus.

A composite total diagram (B)
B.I. Forest trees and shrubs. Pinus, Betula, Alnus and Corylus have been divided by four on account of their larger pollen production (Andersen 1970).

B.II. Juniperus

B.III. Ecologically undifferentiated plants. Vegetation that can be shown to be very local, at least in one diagram, has been excluded from both for the sake of comparability.

The wild grasses are not included.

B.IV. Terrestrial herbs

NAP and spores section (C, D, E, F)
The basis for the calculation is a reduced AP sum (Betula, Pinus, Corylus, Alnus divided by four)

Group C. Terrestrial herbs. The classification into terrestics and varia follows Königsson (1968).


C.2. Other terrestrial plants. Separate curves have been drawn for the most frequent plants.

Group D. Ecologically undifferentiated pollen and spores (Varia). In the Vildmossen diagram, the following subdivision is made:

D.1. Plants of the fen proper. Plants of which macrofossil remains have been found in the peat and/or are characterised by curves with high values and violent changes. Polypodiaceae (excl. Lastrea dryopteris and Polypodium vulgare) Cyperaceae, Filipendula, Sphagnum, Equisetum, Potentilla-type (probably Comarum palustre). The curves are drawn at half the percentage scale compared with other curves.
D:2. Other varia: Gramineae spont., Dipsacus, Compositae Liguliflorae, Compositae Tubuliflorae, Cerastium-type, Ranunculus, Umbelliferae, Valeriana, Thalictrum, Caltha-type, Galium, and others.

Group E. Fen plants. In the Vildmossen diagram, the bulk of the pollen in this group emanates from Typha latifolia. Typha spargani-type, Lythrum, and Lysimachia are represented, but with low values. In the Flären diagram, the curve has not been drawn, owing to low frequencies.

Group F. Aquatic plants. Isoetes, Alisma, Eu-Potamogeton and Myriophyllum. No curves have been drawn in the Flären diagram.

Algae (G)

Pediastrum. The curve has only been drawn in the Flären diagram. Few algae are represented in Vildmossen. The basis for the calculation is the AP sum + Pediastrum.

Destruction (H)

The degree of destruction is calculated as the frequency of corroded pollen grains of Betula, Alnus, Corylus, Ulmus, Tilia, and Gramineae. The basis for the calculation is the total number of these pollen.

4.2 Lake Flären (Svennebysjön)

4.2.1 Site, sampling and sediments

Lake Flären (Svennebysjön) is situated in close proximity to the stone-wall areas at Fläret (cf. Fig. 1:6). It is a fissure-valley lake, stretching north-west and south-east, about 1 km long and 0.5 km broad. The inflow to the lake is small and its drainage basin is only 3-4 km², consisting of arable land at the north-western and south-eastern ends and of wood-covered till and bedrock on its northern and southern sides. Its maximum depth is said to be 11 m. The core for pollen analysis was taken 200 m off the shore in the western part of the lake at a depth of 4.85 m. The sampling was carried out in September 1975 with a Livingstone corer from a boat.

Sediment description:

0-22.5 cm. Dark-coloured, grey, clayey gyttja

22.5-272 cm. Light-grey, clayey gyttja
between 33 and 60 per cent (mean 44) and *Betula* between 12 and 45 per cent (mean 25). *Betula* has a very sharply marked maximum at the level 134. The curve for *Salix* is generally low, but it occurs more frequently in the lower half of the diagram and has a maximum at the level 144. No separate curve for Quercetum mixtum has been drawn, since its components, with the exception of the oak, occur very sparsely. *Ulmus*, *Fraxinus* and *Tilia* are somewhat more frequent in the older part of the diagram. Throughout most of the diagram, *Quercus* is stable around 5 per cent but decreases suddenly at the level 55. The *Corylus* curve has many parallels with *Quercus*. It has a minimum in the middle of the diagram and also decreases in the upper part. The curve for *Alnus* is stable in the lower part around 10 per cent and then diminishes in the middle to 2 per cent. Towards recent times, the curve increases.

The curve for *Picea* is low from the beginning. At the level 172 it increases from 4 to 9 per cent, but stable values above 10 per cent are not reached until the level 105. The *Juniperus* curve varies between 5 and 12 per cent. In the middle of the diagram, the curve has a minimum and then culminates at the level 105. At the level 45, where both *Quercus* and *Corylus* are decreasing, *Juniperus* is eventually reduced to 2–3 per cent of the arboreal-pollen sum.

Comparisons with other diagrams
The tree-pollen curves described above correspond well to a number of other diagrams from Östergötland and the neighbouring provinces (Helmfrid 1958, Magnusson 1964, Königsson 1971, Norrman & Königsson 1972, and Göransson 1973, 1977). *Pinus* and *Betula* predominate over all other species and *Picea* is present in the whole diagram. The courses of the curves in the middle of the diagram, characterised by a maximum for *Betula* and minima for *Alnus*, *Corylus* and *Juniperus*, are almost identical with those in a diagram from a submerged peat sequence in the Huskvarna bay (Königsson 1971) and with those in the diagram from Storsjön in the western part of Östergötland (Helmfrid 1958; see the diagram redrawn in Norrman & Königsson 1972). Similar vegetational changes are seen in most modern pollen diagrams from Sweden, but they may take other forms. The increase of *Betula* in the Flären diagram often corresponds to increases of other deciduous trees. In Blekinge, *Quercus* increases (Berglund 1966). On Öland an increase of the mixed oak forest is shown in connection with the decrease of *Juniperus* in some diagrams, while in others the regeneration of the open lands is marked by an increase of *Pinus* or *Betula* (Königsson 1968:138). In the Striern area in southern Östergötland...
land, this limit is characterised by a minimum for Alnus and small maxima for Corylus and Tilia, but there is no corresponding minimum for Juniperus. Juniper has low values in Striern during a large part of the Iron Age (Göransson 1973, 1977). Since Picea is already represented by low values in the deepest analysis and only increases slowly, it is difficult to date the lower part of the Flären diagram by comparisons with other diagrams. Göransson dates the immigration of spruce to the Striern area (35 km south of Lake Flären) to c. 400 B.C. The rational limit is dated to c. 100 B.C. (Göransson 1977:48). In western Östergötland, Magnusson has dated the Picea immigration to c. 200 B.C. (Magnusson 1964). The increase of Picea at the level 172 in the Flären diagram can thus, with much uncertainty, be dated to the last few centuries B.C. But Göransson has also shown that the rational Picea limit may be metachronous within rather limited areas. The immigration of spruce is to a great extent dependent on the activities of man. The clearance carried out in the centuries around the Birth of Christ paved the way for the spruce (Göransson 1977:37).

The introduction of Secale to Östergötland and neighbouring provinces has been dated by different authors to the Birth of Christ (Helmfrid 1958), A.D. 300–400 (Magnusson 1964), soon after the Birth of Christ (Västergötland, Fries 1958:32), A.D. 100 (Husvarna area, Königsson 1971), and the third century A.D. (Norra Tjust, Göransson 1976). In Flären, the first finds of Secale occur at level 212 and a continuous curve from level 192.

In correspondence to the datings from Blekinge, Öland and the Striern area, the Juniperus minimum at level 134 can be dated to the seventh century A.D.

In Lake Striern, Göransson identified two sub-zones during the Picea pollen-assemblage zone. During the first part—the Picea-Quercus sub-zone—Quercus was still quite important, but at a level dated to c. A.D. 1000 it decreased. The same limit is seen in the Flären diagram at level 65, which thus may be dated to c. A.D. 1000.

The comparisons with other diagrams thus suggest the following provisional dating of the Flären diagram:

- 172 rational limit of Picea 100 B.C.
- 135 Juniperus minimum A.D. 650
- 65 Quercus decrease A.D. 1000

### 4.2.3 Radiocarbon datings

Twelve samples from the core have been dated by the radiocarbon method (in 1976–77). Each sample consisted of a 15-cm-long part of the core, roughly corresponding to 10 g of organic matter. Only the insoluble parts of the samples were dated. The values are shown in Table 2, together with a recalculation according to Damon et al. (1974) (cf. subsection 2.3.3). In Fig. 4:3, the corrected values are plotted against the sediment depth.

In four cases samples have older datings than the samples under them. In two cases, this is within the calculated degrees of uncertainty, but the datings St 5844 and St 5565 show values outside the confidence interval. The confidence interval is calculated on a standard deviation of 1σ, which means that 32 per cent of all samples have an actual radiocarbon age outside the interval (Östlund 1963). Taking this into consideration, it is not surprising that four out of twelve samples have datings contradictory to the stratigraphy. A regression line based on the method of least squares has been drawn in the diagram. The

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**Fig. 4.2. Chemical analyses from Lake Flären. The diagram has been prepared by Dr. Ulf Quarfort, of the Department of Quaternary Geology, University of Uppsala.**
covenience between sedimentation and time is not a priori to be seen as a linear function. Digerfeldt has used a fifth-degree polynomial on Lake Trummen, but during Sub-Atlantic times the sedimentation seems to have been rather even (Digerfeldt 1972). In his investigation of Storsjön, Helmfrid has assumed a logarithmic time-scale, owing to the compression of older sediments (Helmfrid 1958:252). The rate of sedimentation may also show drastic changes due to cultivation in the drainage basin (see below and Maher 1977:37).

Taking into consideration the good fit of a first-degree equation ($R^2=0.95$), the short time described by the Flären diagram and the confidence intervals of the radiocarbon datings, there is no reason to believe that a polynomial regression would contribute any further enlightenment with regard to the sedimentation. The rate of sedimentation can thus be calculated as 1 cm in 11.7 years (8.5 cm/100 years).

Besides the sources of error inherent in all radiocarbon dating, the dating of lake sediments may also include the following two:

1. The organic matter which is dated must not have been derived from vegetation or fauna living at the time of sedimentation. It may originate in somewhat older or in some cases much older material (Olsson 1972a). This source of error cannot be excluded in the present case. The low organic component in the sediments suggests that the main parts of the sediments in the lake have been transported from surrounding areas and thus have carried organic matter of older origin. In southern Finland, radiocarbon datings from a lake have shown values that are 700–800 years too old, because of the erosion of old, organic matter from cultivated fields (Huttonen & Tolonen 1976). Changes in the contents of sediment caused by cultivation in the vicinity of the lakes, have also been found in other lakes in Finland (Tolonen et al. 1975). The chemical analyses of the sediments give us no reason to think that there were any sedimentation changes of that magnitude in Lake Flären, but, if the organic matter in the lake included old material, one would expect the radiocarbon datings from the periods of increased organic matter to be older than expected from the regression line. This is, however, not the case. St 5843 is later than expected and St 5564 is only 100 years older than expected. Contaminations leading to radiocarbon dates older than expected may also be caused by very old material, such as graphite. One per cent of infinitely old carbon in a sample would, for example, yield a result that is 80 years too old (Olsson 1972b). A dating of the soluble fraction of the sediment may in some cases yield a more reliable result (Olsson 1979).

2. It has been shown that subaqueous plants may have a lower $^{14}C$/C$^{12}$ ratio than contemporary terrestrial plants. According to Berglund, this would in the first case be valid for plants living in brackish or salt water. Owing to the retarded cycle of carbon dioxide in the sea, these plants would have a lower $^{14}C$ activity (Berglund 1964:7). In his investigations on Öland, Königsson has shown that also peat has yielded too old datings, caused by plants living on inactive carbon dissolved from CaCO$_3$ in the limestone (Königsson 1968:120). The latter source of error can be excluded in this case, since the clayey gyttja in Flären contains only small amounts of calcium and soils rich in calcium exist only locally in this part of Östergötland (Bergström & Kornfält 1973). But even the water in lakes may have a lower $^{14}C$ content than that of the contemporaneous terrestrial vegetation. Submerged plants, which may form a part of the sediment, may thus have lived in water with a lower $^{14}C$ activity. This phenomenon has been called the “reservoir” effect and may be an important source of error, giving too old datings (Olsson 1979a).

If the regression equation in Fig. 4:3 is used to date the Flären diagram, the following dates will be given to the vegetational changes, which were preliminary dated in subsection 4.2.2.

172 rational limit of Picea A.D. 50
135 Juniperus minimum A.D. 500
65 Quercus decrease A.D. 1300

The datings thus provided by the regression equation agree fairly well with the datings from comparisons with other diagrams, but deviations in both directions occur. From the comparisons with previous studies, there are thus no immediate indications of radiocarbon dates that are systemati-

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**Table 2. Radiocarbon datings from Lake Flären**

<table>
<thead>
<tr>
<th>Dating no.</th>
<th>Sediment depth (cm)</th>
<th>$^{14}C$-years</th>
<th>Calibrated age in calendar years</th>
</tr>
</thead>
<tbody>
<tr>
<td>St 5565</td>
<td>43</td>
<td>690±100</td>
<td>A.D. 1250</td>
</tr>
<tr>
<td>St 5846</td>
<td>58</td>
<td>480± 80</td>
<td>A.D. 1440</td>
</tr>
<tr>
<td>St 5564</td>
<td>78</td>
<td>905±120</td>
<td>A.D. 1050</td>
</tr>
<tr>
<td>St 5845</td>
<td>93</td>
<td>1070± 90</td>
<td>A.D. 895</td>
</tr>
<tr>
<td>St 5844</td>
<td>115</td>
<td>910± 90</td>
<td>A.D. 1045</td>
</tr>
<tr>
<td>St 5563</td>
<td>130</td>
<td>1425± 80</td>
<td>A.D. 545</td>
</tr>
<tr>
<td>St 5562</td>
<td>140</td>
<td>1505± 80</td>
<td>A.D. 465</td>
</tr>
<tr>
<td>St 5843</td>
<td>155</td>
<td>1460± 80</td>
<td>A.D. 310</td>
</tr>
<tr>
<td>St 5561</td>
<td>205</td>
<td>2160± 80</td>
<td>255 B.C.</td>
</tr>
<tr>
<td>St 5842</td>
<td>220</td>
<td>2395± 85</td>
<td>535 B.C.</td>
</tr>
<tr>
<td>St 5841</td>
<td>259</td>
<td>2960±135</td>
<td>1249 B.C.</td>
</tr>
<tr>
<td>St 5560</td>
<td>273</td>
<td>2895± 85</td>
<td>1160 B.C.</td>
</tr>
</tbody>
</table>

The $^{13}C$ content was not determined for these samples.
cally too old. However, as Olsson has pointed out, the results from lake sediments should be regarded with suspicion a priori, on account of the sources of error indicated above (see the references above, together with Olsson 1974, 1979b, and Olsson & Florin 1980).

Analyses of the soluble fraction of a lake sediment, estimates of the apparent age and dating of a synchronous level in Sphagnum peat, have for example in one case showed that the dating of the immigration of spruce based on the lake sediment was c. 390 years too old. This refers to a lake with dy sediment in the Kolmården area in Östergötland (Olsson & Florin 1980). The consequences of this dating for the chronology of the human influence on the landscape during the last 2000 years have not been evaluated. It is possible that future studies, using the same methods, may revise this chronology.

Until further studies have been carried out, the datings suggested by the regression equation and supported by the comparisons with other diagrams seem to be the most reliable. The datings in the following pages are based on this.

4.2.4 Development of the agrarian landscape

On the basis mainly of the development of the cultivated plants and the plants favoured by man, the diagram has been divided into five zones (Fig. 4:4). The development has been interpreted as follows:

Zone A (1000 B.C. to 100 B.C.). The influence of man is gradually increased in the oldest part of the diagram. Cerealea is already represented with low values in the oldest samples, as well as some other plants favoured or dependent on man (Rumex acetosella, Chenopodiaceae, and Filipendula). Artemisia and Plantago lanceolata, both occurring during this zone, should also be interpreted as cultural indicators, the latter being a clear indicator of open pastures. It needs full sunlight and does not grow in pastured woods (Iversen 1941:40 f.; 1973:84). Together with the well-developed curves for Gramineae spont. and Juniperus, this indicates the existence of extensive, open pastures, which were enlarged during the period. The arable was also expanded during the period.
Zone B (100 B.C. to A.D. 500). The occurrence of rye has been used to delimit the zone. A continuous curve for this pollen type has been established from c. 100 B.C. As rye is a large pollen producer (Fægri & Iversen 1975:53 ff.), its actual impact on the landscape must not be over-emphasized, but, since the other cereals are constant at the same time as rye increases, this points to a total increase of the cultivated area during the period, which reaches a peak at about A.D. 300. The zone limit A/B is also marked by a continuous curve for Cannabaceae (see further under zone C). During the zone, many curves indicate a very open landscape. The curves for the terrestic herbs are high, and light-demanding trees like Fraxinus, Carpinus and Salix have been favoured directly or indirectly by the activities of man, maybe as fodder producers. The high values for Pinus do not necessarily represent an increased occurrence of pine, but rather increased possibilities for the dispersal of pine pollen, due to the open conditions (cf. Fægri & Iversen 1975:60).

The development towards a more open landscape culminates in the last part of the zone and after that the plants favoured by man decrease again. The zone limit B/C marks a maximum for the regeneration of woodlands on previously pastured lands. Juniperus, Gramineae and Plantago lanceolata diminish. On the level 134, Juniperus reaches its absolute minimum during the 3000-year period. Taking into consideration the reversible relation between the Juniperus and the Betula curves at this level, the latter has been interpreted as indicating an invasion of Betula verrucosa on well-drained pastures earlier covered with Juniperus shrubs.

Zone C (A.D. 500–1000). The curves for the cereals also decrease at the zone limit B/C, but no break in the cereal cultivation can be shown. In connection with the sample 135, in which the cereals reach a minimum, samples were analysed at 2 cm above and below the minimum. This density of sampling corresponds to a time period of about 20 years. Also on these levels, a number of Cerealea pollen were found. Any total abandonment of the cultivated fields in the region must thus have been of a very short duration. At the level 115, the cereals have already increased again. The further development of the pasture lands also points to a rather quick re-establishment of the pastures. A prolonged aban-
dament of the pastures on well-drained land would lead to the birch being followed by other trees (spruce and/or pine). The abandonment of pasture lands must therefore have been of a fairly short duration (less than one birch generation). The vigorous development of the Juniperus curve shows that the pastures were used again during the late Iron Age. Culminations of Juniperus during this period have previously been shown in different parts of southern Sweden (Fries 1958:33, Helmfrid 1958:258, Berglund 1966:144, Königsson 1968:127, Digerfeldt 1972 and others).

The chronologically well-defined culmination of Cannabaceae pollen coincides well with previous results in Östergötland, Västergötland, Uppland and the Oslofjord area (Helmfrid 1958, Fries 1958, 1962, 1969, Haafsten 1956). Hemp and hop are difficult to discern by standard pollen-analytical methods. Hop has been growing wild in Sweden since Atlantic times, but its earliest cultivation has not been dated. Hjelmroos has suggested that hop may have been cultivated as early as the Iron Age in northern Sweden (Hjelmroos 1978:54), while Fries interprets the occurrence of this pollen type in Västergötland as having been caused by hemp cultivation during the late Iron Age (Fries 1958:43). The abundant occurrence in lake sediments can then be explained as having been caused by retting the hemp in the lake. On the basis of a size analysis and the identification of macrofossil remains on a contemporaneous archaeological site on the shore of the lake, Påhlsson has recently identified a Viking-Age or early-medieval culmination of this pollen type in Dalarna as being one of Cannabis sativa (Påhlsson 1981).

Zone D (A.D. 1000–1400). Between the levels 95 and 85, the Cannabaceae curve decreases markedly. Two radiocarbon datings are centred around A.D. 945 and A.D. 1050 respectively. During the zone, the first step towards the historical landscape, characterised by arable farming, is taken. The Secale frequency doubles during a 100-year period and somewhat earlier the other cereals double their frequency during the same time. A corresponding increase of the cereals has been regarded by Helmfrid as having been caused by the introduction of the two-field system (Helmfrid 1962:126). The introduction of a two-field system, however, does not presuppose an increase of the yearly sown area, so it is doubtful if this change would directly influence the pollen rain. It is more reasonable to consider the cereal increase in connection with a general expansion and with the establishment of avgårdatorp during the late Viking age or early mediaeval times. Some trees of pastures and meadows (Juniperus, Quercus and Corylus) decrease during the earlier part of the zone. The same is true of Plantago lanceolata, but there is no evidence of any decisive decrease of pastures and meadows during this zone.

Zone E (A.D. 1400 to the present time). At the level 40–50, Quercus, Juniperus and Corylus decrease, while the cereal cultivation represented by Secale increases. The decrease of Quercus, Juniperus and Corylus must probably be interpreted as a development of treeless pastures and meadows, but perhaps also as the clearance of former meadows and pastures for arable farming. The proportions of arable and meadow in the agrarian landscape that are known from the cadastral maps of the 17th century would, according to this, have originated in the 15th or 16th century.

Erosion in the drainage basin?
The organic content of the sediment varies between 8 and 26 per cent, measured as loss on ignition. There is a large covariation between periods of increase of organic matter and periods of increase in human influence (Fig. 4:4). Increases in organic matter can be dated to c. 700 B.C., 0, A.D. 700, 1200 and 1800. All these dates correspond to increases for some or all of the curves for Cerealea, Secale and Chenopodiaceae, except the very recent increase in A.D. 1800. But at this time a sharp increase in the cultivated area can be documented from series of maps. Owing partly to the decrease in rye cultivation (cf. Vourela 1970:7), full justice is not done to this increase of the cultivated area in the pollen diagram. A large part of the catchment area of the lake consists of old arable land on the Fläret and Svenneby farms, documented on the oldest maps (17th century) and consisting of light, clayey soils. Cultivation of these soils most probably influenced the sediments in the lake. The conversion of grasslands to arable lands, causing a slight increase in the erosion of the topsoil, may thus be responsible for the increases in organic sediments.

Pastoral/ taxable index
Different indices have been used to describe changes in the ratio of pasture to arable land. In Sweden, no complex indices, including many species on each side, have been developed (cf. Roberts et al. 1973). The Plantago lanceolata/Cerealea index has been used by Lange in eastern Germany (1971, 1975) and by Welinder in Sweden (1975). It is a rough measure but has the advantage that its components are indisputable, as regards their occurrence on arable or pasture. It has been shown to coincide well with macrofossil analyses and faunal remains (Lange, op. cit.). In Fig. 4:5, Secale is not included in Cerealea.
With reservations for the problems involved in interpreting the index (cf. Welinder 1975:70), the relation between arable farming and cattle-breeding in the region can be described as follows.

Zone A. During the last millennium B.C., there was a gradual increase in the role of cattle-breeding.

Zone B. Both arable and pasture increase during the zone, but there is a general decrease in the importance of pastures. At the level 149, where the human influence on the landscape reaches a peak, the index is at a level not reached again until mediaeval times (end of zone D).

Zone C. During the oldest part of the zone, the index is in favour of cattle-breeding but is later stabilized on an average level.

Zone D. During the last part of this zone, there is a distinct change in the index. The role of pastures is diminished. This is also seen in the main diagram, in which trees in meadows and pastures are decreasing as the cereals increase.

Zone E. The pastures remain at a low level.

If we relate these changes to different farming systems, the early parts of zone A would seem to represent a system with a weak integration between cattle-breeding and arable farming, where the restoration of nutrients is based on shifting cultivation. Zones B and C may represent an infield system with an intricate interdependence between arable and pasture. The interdependence is still present during zones D and E, but the arable is greatly increased and the restoration of nutrients to the soil is partly brought about by a two-course rotation and, later, by modern crop rotations and chemical fertilizers.

A change towards a greater role for arable farming is, however, also to be seen at a time corresponding to A.D. 300. During the last part of zone B, the expansions of the cattle stock and the pasture lands evidently did not keep pace with the expansion of cultivated lands. This may indicate exploitation beyond the limits of the farming system. It was followed by the general decline of the cultivated plants and the vegetation influenced by human activities.

Fig. 4.5. Frequencies of non-arboreal pollen (NAP) and pastoral/variable index, Lake Flären.
4.3 Vildmossen (Storängsmossen)

4.3.1 Site, sampling and stratigraphy

The wetlands surrounding the Fläret I settlement (cf. section 2.4) were, until the 19th century, mainly used as meadows. To judge from the stone walls, these areas were already enclosed at the time of the settlement (c. A.D. 200) and were possibly used as wet meadows for hay. The use of the wetlands around the Fläret I settlement during the early 19th century is shown in Fig. 4:8). The wetlands then formed a part of a large meadow called “Storängen”. When the wet meadows were drained in the late 19th and early 20th centuries, an area of 3 ha of the former “Storängsmossen” was left uncultivated. The drainings led to the establishment of a dense pine-wood, which, before it was cut down in 1975, also housed scattered spruces and deciduous trees, with an undergrowth of Athyrium filix-femina, Lycopodium and Vaccinium myrtillus. The local name “Vildmossen” refers to this recent stage of its development.

The undisturbed g爹tja and peat sediments give us an unique opportunity to study the actual vegetation at the bottom of the enclosed depression. The organic deposits are between 70 and 110 cm and cover a post-glacial clay. Where the thickest organic deposits were found, a sampling pit was dug. Two preliminary, radiocarbon datings were carried out (St 5775 and St 5752). A part of the peat section intended to cover the time period up to A.D. 1000 was later taken in a soil box (60 cm under the surface and downwards). The following stratigraphy was noted:

<table>
<thead>
<tr>
<th>Layer</th>
<th>Depth, cm</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0–50</td>
<td>Sphagnum peat, recurrence surface at 30 cm</td>
</tr>
<tr>
<td>5</td>
<td>51–76</td>
<td>Carex peat, remains of Equisetum</td>
</tr>
<tr>
<td>4</td>
<td>77–85</td>
<td>Carr peat, muddy, pieces of roots and other wood fragments</td>
</tr>
<tr>
<td>3</td>
<td>86–c. 93</td>
<td>Coarse detritus g爹tja</td>
</tr>
<tr>
<td>2</td>
<td>c. 93–109</td>
<td>Clayey g爹tja, upper boundary very diffuse</td>
</tr>
<tr>
<td>1</td>
<td>110–</td>
<td>Clay</td>
</tr>
</tbody>
</table>

Wood fragments were found in all layers, except the Sphagnum peat and the clay.
4.3.2 The diagram

Description
The arboreal-pollen part of the diagram is dominated by *Pinus* and *Betula*. *Pinus* has in the lower half values between 50 and 60 per cent but decreases markedly at levels 84-78. The curve for *Betula* increases at the same level from values between 10 and 20 per cent to between 30 and 50 per cent in the upper half of the diagram.

*Alnus* is high (20 per cent) from the beginning but decreases gradually and from level 92 onwards it never exceeds 10 per cent. *Tilia* has a maximum in the lower part of the diagram at 7 per cent but decreases sharply at level 92. *Quercus*, on the other hand, is low from the beginning but increases gradually and reaches a maximum (19 per cent) at 68 cm below the surface. In the uppermost analysis, a decrease is recorded. *Juniperus* has generally low values and never exceeds 3 per cent. It has two minima in the middle of the diagram. *Picea* is present in the lowermost analysis but has an increase from 2 to 4 per cent at level 96.

Comparisons with the Flärens diagram
The high values for *Betula* indicate that the birch grew close to the sampling site, as did probably also *Salix* and *Alnus*. *Pinus*, however, can hardly have been a part of the fen vegetation at that time and its high values are caused by pollen transported for long distances in an open landscape. In the later part of the diagram, the local *Betula* vegetation may have hampered this.

Owing to the local character of the diagram, the other trees also show other frequencies than those in the Flärens diagram. Both *Tilia* and *Quercus* reach high values. The trees of outlying lands and pastures (*Picea* and *Juniperus*) are less frequently represented in the diagram. Already from the arboreal section of the diagram, it can thus be characterised as reflecting an open, indago landscape.

As to the dating of the diagram, some preliminary conclusions can be drawn from the tree-pollen curves. The *Picea* increase at level 96 may in comparison with the Flärens diagram, be dated to c. A.D. 50. The very sharply marked maximum of *Betula* documented in the Flärens diagram may be hidden in the abundant occurrence of *Betula* above the level 86 in this diagram. To judge from the
Table 3. Radiocarbon analyses from Vildmossen/Storängsmossen

<table>
<thead>
<tr>
<th>Dating no.</th>
<th>Depth (cm)</th>
<th>Type of sediment</th>
<th>C(^14)-years B.P. ((T_1^2 = 5568))</th>
<th>Correction according to (\delta C^{13})</th>
<th>Calibrated age in calendar years</th>
</tr>
</thead>
<tbody>
<tr>
<td>St 5775</td>
<td>50-57</td>
<td>Carex peat</td>
<td>880±120</td>
<td>-</td>
<td>A.D. 1075</td>
</tr>
<tr>
<td>St 5752</td>
<td>77-84</td>
<td>Carr peat</td>
<td>1085±100</td>
<td>-</td>
<td>A.D. 880</td>
</tr>
<tr>
<td>St 7552</td>
<td>70-71</td>
<td>Carex peat</td>
<td>895±80</td>
<td>855±80</td>
<td>A.D. 1100</td>
</tr>
<tr>
<td>St 7551</td>
<td>76-79</td>
<td>Carr peat</td>
<td>865±80</td>
<td>805±80</td>
<td>A.D. 1145</td>
</tr>
<tr>
<td>St 7550</td>
<td>82-85</td>
<td>Carr peat</td>
<td>975±140</td>
<td>910±140</td>
<td>A.D. 1045</td>
</tr>
<tr>
<td>St 7647</td>
<td>86-91</td>
<td>Coarse detritus gytta</td>
<td>935±115</td>
<td>890±115</td>
<td>A.D. 1065</td>
</tr>
</tbody>
</table>

**Juniperus curve, either** the level 82 or level 76 may represent this maximum. The repetition of the pollen curves that can be seen for Betula and Juniperus between these two levels is also found for Pinus, Polypodiaceae, Cyperaceae and Filipendula and may have been caused by a redeposition of sediments. The increases of Ulmus and Tilia at level 80 may have had the same cause. The decrease of Quercus and Corylus in the Flären diagram is not represented in this diagram but may correspond to the incipient decrease in the latest analysis. Comparisons with the datings from Flären thus suggest the following:

- 96 rational limit of Picea A.D. 50
- 82–76 Betula maximum A.D. 500
- Juniperus minimum
- 60 beginning of Quercus decrease < A.D. 1300

**4.3.3 Radiocarbon datings**

In all, six samples from this section were dated by the radiocarbon method (see Table 3). Compared with the datings suggested above, four of the radiocarbon samples showed unexpectedly late ages (St 7647, 7550, 7551, 7552). It has not been possible to go deeper into the cause of this discrepancy. It may have been caused by a hiatus in the sedimentation. The period between the immigration of spruce (c. A.D. 50) and c. A.D. 900 may thus either be absent or be severely compressed.

It is also possible that the discrepancy was caused by a systematic error in the radiocarbon dates. This is supported by the fact that, in spite of the local character of the diagram, zones mainly based on the herbal-pollen curves, comparable to those in the Flären diagram, can be recognised, which agrees with the datings suggested in subsection 4.3.2.

A systematic error in the datings may be caused by the intrusion of young rootlets of sedges or trees into the peat and gyttja. The sample from the Carex peat/Sphagnum peat limit (St 5775) has probably little contamination, since the overlying Sphagnum peat does not produce rootlets. It also fits well into the datings from the vegetational development.

The upper part of the diagram can thus with great certainty be dated to c. A.D. 1000. In the lower part, the rational limit of Picea provides a fairly secure dating of level 96 to the centuries around the Birth of Christ. However, no unambiguous datings can be made for the interesting middle part of the diagram.

**4.3.4 Development of the agrarian landscape**

On the basis mainly of the terrestrial herbs, it is possible to distinguish three zones in the land-use development. These zones show characteristics similar to those of zones A, B and C in Lake Flären, but, since reliable datings are not available for the whole diagram, only the lowermost zone (A) can with some certainty be connected with the corresponding zone in the regional diagram.

**Level 108 to 96 (zone A).** The lower part of the diagram—probably corresponding to the centuries before the Birth of Christ—is characterised by Cerealea (determined as Hordeum and Avena types) and of high frequencies for plants common as weeds on arable land or on open ground near settlements. Chenopodiaceae, which reaches a maximum of 9 per cent, probably grew close to the fen. Species belonging to Chenopodiaceae are common as weeds but may also have been deliberately cultivated in prehistoric times (Fries 1958:46). They witness to intensive farming, in which the soil lay bare yearly (Engelmark 1981:43). The curve is closely followed by Melampyrum and this covariation suggests that M. arvense, formerly a weed on arable land (Linné
1745:68, Sterner 1938:149), may be the origin of the pollen. A number of pollen types in the varia section also have high values during this and the following zones (Compositae liguliflorae, Cerastium-type, Compositae tubuliflorae, Ranunculus, Dipsacus). These taxa include both arable weeds (such as Knautia arvensis), pasture indicators (such as Ranunculus acris) and species that may have grown on wet grounds in the fen or close to it.

**Level 96 to 82.** The first finds of Secale and continuous curves for Cannabaceae and Polygonum (P. convolvus, P. aviculare) can be established from this level. The high frequencies for arable weeds (Polygonum, Chenopodiaceae, Melampyrum) are clear evidence of tilled fields in the vicinity of the fen, but the cereal frequencies are lower than during zone A.

Increases of grassland and pasture indicators, such as Rumex acetosai/acetosella-type, Plantago lanceolata and Pteridium, should also be noted during this zone.

**Level 82 to 60.** Between 82 and 76 cm below the surface, many curves change. The Juniperus minimum and Betula maximum have already been mentioned. The cereal maxima at this level may have been caused by redeposition of the muddy carr peat and cannot be interpreted, but most herbs indicating arable or other bare soils decrease around level 82, while grassland indicators, such as Rumex, Artemisia and Plantago lanceolata, continue and Juniperus increases during the zone. To judge from this, the settlements and/or arable fields were more distant from the fen during this part of the diagram. The curves for grassland indicators, for Corylus and Quercus, suggest that the closest areas were mainly used as meadows and pastures.

Owing to the low values for the cereals and ribwort plantain, no arable/pastoral index has been calculated from this diagram. Judging from all the herbaceous curves, zone A was mainly characterised by arable indicators. During the middle part of the diagram, some grassland and pasture indicators were added, while the last part of the diagram is dominated by pasture and other grassland indicators.

Since no reliable datings of the diagram are available, it is difficult to state the connection with the period of settlement and stone walls in the Fläret area. Under all circumstances, the levels 82 to 60 correspond to a period when the settlements at Fläret I and Fläret II were already abandoned. This is also supported by the pollen curves, in which pasture and other grassland indicators predominate.
while the weeds of bare ground show only low values.

4.3.5 Development of the fen

An alder carr predominated in the area during the earliest part of the pollen diagram. The sampling site—to judge from the sediments, a pool or a small lake—was surrounded by an Alnus wood, with an undergrowth of Polypodiaceae. From the level 104, Alnus decreases, while Cyperaceae and Filipendula reach high values and replace the Alnus wood. As can be seen from section B, a number of ecologically undifferentiated herbs also increase at this level in the diagram. The alder carr was thus gradually transformed into an open fen, free from trees. The curves for Thalictrum, Valeriana and Caltha are increasing and should probably be interpreted as T. flavum, V. dioeca and C. palustris, all of them characteristic of moist meadows, rich in herbs (Sjörs 1956:150). The cause of this transformation of the alder carr cannot be interpreted from the diagram. The alders may have been drowned by a rise in the water level or cut down by farmers to create hay meadows or pastures (cf. Iversen 1973:110, Göransson 1977:123). The result is the same: a moist hay meadow with a rich production of sedges was formed. The transformation was almost synchronous with the immigration of spruce and can be dated to the time span 500 B.C. to A.D. 200.

The fen vegetation is abruptly changed at 80 cm, when all the curves characterising the previous stage decrease. The culmination of Betula must have been of local origin. Sphagnum, Equisetum and Potentilla (probably Comarum palustre) increase. The increase of Sphagnum points to poorer conditions, and the
open character of the fen is changed by the Betula overgrowth. This change cannot be dated, but the overgrowth must at least have been completed before A.D. 1100.

The central part of the depression probably almost lost its value as a fodder producer when Sphagnum peat began to form at the site (50 cm under the surface). In the map of 1694, the whole area is described as “Tran och hvitmåssevall” (characterised by Oxycoccus quadripetalus and Sphagnum) and produced 2 lass, as compared with an area of the same size termed “Starrvall” (Carex), which produced 17 lass. To judge from the 1825 map, the Sphagnum growth and the deterioration of the wet meadows continued in the 18th century. The previously mentioned “Starvall” is valued low and called “Blackmåssen” (bog), but it has a small, marginal fen of Carex and Equisetum which is valued more highly (Fig. 4:8).

The present Vildmossen bog thus had its highest value as a fodder producer during the first centuries after the transformation of the alder fen (from level 100 to 84). It is not possible to say how long this stage lasted, but at least the early period of this wet meadow was synchronous with the settlements and the stone walls. The establishment of the stone walls around the wetlands can thus be directly connected with their transformation from alder carrs to productive moist or wet meadows.

4.4 Vegetational change and farming systems

1000 B.C. to 100 B.C. A slow but continuous increase of arable fields and open pastures took place in the region during the late part of the Bronze Age and the early parts of the Iron Age. The local pollen diagram shows arable indicators in the vicinity of a settlement during this period. This may indicate a low degree of integration between arable farming and cattle-breeding. To judge from the arable weeds in the local diagram, the fields were, however, intensively tilled during the last part of this period.

100 B.C. to A.D. 500. The vast expansion of the agrarian landscape and the creation of open and half-open vegetation during this period were connected with the introduction of an infield system with enclosed meadows. A number of other agrarian innovations can be dated to the early part of this period: the iron sickle (Leopold 1975, 1976), the clearing of permanent arable fields (Lindquist 1968:59), the cultivation of rye (subsection 4.2.4), and the transformation of alder carrs into pasture or hay meadows (Göransson 1977:123, subsection 4.3.5 in the present work). The integration of arable farming and cattle-breeding within the same farming system was completed by the creation of cattle paths and stone-wall enclosures around the arable land and the meadows. To judge from the datings, the introduction of new tools and new crops and the clearing of the alder carrs preceded the laying out of the stone walls, which thus seem to come as the final product of the agrarian expansion.

During the third and fourth centuries A.D., the expansion reached a peak and a very open landscape was created. This expansion is shown not only in the Roxen plain, but also in the woodlands in southern Östergötland, where Göransson has shown arable expansion (finds of Secale) on a small, isolated unit (1977:126). Archaeological evidence for expansion in the southern woodlands during this period has been presented by Nilsson (1976b). This supports the hypothesis that the central parts of Östergötland were fully colonised—within the framework of the actual farming system—in the third and fourth centuries A.D.

During the last part of the period, the arable area was expanded, but the expansion of the pastures did not keep pace. This may have led to a lack of manure and an over-exploitation of the arable. It was followed by a decline of the human influence on the landscape. The pasture lands are much less used and the cultivation of cereals also decreases. No break in the continuity of cultivation can be proved, but the signs of a decline in agrarian production are indisputable.
A.D. 500 to A.D. 1000. Both arable and pasture soon recover. The late Iron Age thus cannot be associated with an increase in the cereal cultivation. The curves for the cereals in the Flären diagram are, in that case, in sharp contrast with a reconstruction, based on other sources, published by Hannerberg, which points to a doubling of the arable between A.D. 700 and A.D. 1000 in eastern central Sweden (1971:64).

There was no radical change in the ratios between different land-use categories in the late Iron Age. Systems of fallow may, of course, have been developed, but, in the relation between arable farming and cattle-breeding, the farming system of the late Iron Age did not differ from that of the previous period. The changes towards a greater role for arable farming occurred after A.D. 1000.
To judge from the pollen-analytical evidence, the proportion between arable farming and cattle-breeding was kept during the late Iron Age at more or less the same level as during the preceding stage. The changes in the landscape during the 5th and 6th centuries A.D. thus cannot be seen as reflecting a strengthened role for cereal cultivation.

The decisive increase in cereal cultivation is not evidenced in the pollen diagrams until after A.D. 1000. From other evidence, we know that the 10th, 11th and 12th centuries represented a critical period in the development; a field layout adjusted to the two-course rotation was introduced, and settlement and lands were regulated according to the soksife (cf. the references in subsection 1.1.4). These changes laid the foundation for the historically known landscape in eastern central Sweden.

The evidence in the intervening period (c. A.D. 600-1000) is only fragmentary and seldom allows of a reconstruction of settlement and land use. The main evidences of the development are the late-Iron-Age cemeteries and the relict features in the 17th-century maps. In the present chapter, the late-Iron-Age landscape is accordingly approached indirectly, with the following questions in mind. What features in the landscape before A.D. 500 survived into the late Iron Age? What elements in the 17th-century landscape can be traced back to the 7th and 8th centuries?

5.1 Skärkind

The area covered by the 8G6c Skärkind sheet of the 1:10 000 map was chosen for a study aimed at comparing the early-Iron-Age landscape with that of the 17th century over a large area (25 km²; see Fig. 1:6). Stone-wall systems in the area have previously been recorded by Lindquist (1968) and Klang & Widgren (1973). In a field survey during the spring of 1978 I recorded all abandoned stone walls, house platforms and other traces of prehistoric settlement. The area was later surveyed by the Central Office of National Antiquities (1979) and the results were placed at my disposal at an early stage by Björn Winberg.

As concerns the structure of the early-Iron-Age landscape, the results from the Fläret area are confirmed. The prehistoric landscape was characterised by single farmsteads, knit together by stone walls. Some of the stone walls can be interpreted with regard to their function (Fig. 5:7). Cattle paths leading from large areas of till and exposed bedrock to the settlement allow of a reconstruction of enclosed or unenclosed land. Within the enclosed land, signs of the clearance of stones for tilling can often be found on the sandy soils, while the greater part of the enclosed land comprises former meadow-land. This points to a fully occupied landscape, in which the proportion of enclosed land may have been the same as during historical times.

The 18th-century landscape in the area has been reconstructed on the basis of cadastral maps from the period 1696 to 1769 (Fig. 5:5). Within the area, there were five single farms and ten hamlets (byar) with two to five farms each. The names of twelve settlements suggest a prehistoric date (-stad, -by and others), while three single farms bear names of later origin (-torp), indicating an establishment in the late Viking Age or early mediaeval times (cf. Helmfrid 1962:93 ff.). Most of the hamlets and farms had their fields divided into two enclosures, i.e. a two-course rotation was practised. The hamlets are usually centrally located between the two fields. The average areas of each farm were 14 ha of arable land and 17.5 of meadow land, together with unimproved pastures.

The comparison between these two cross-sections points to vital differences in the structure of the landscape (Fig. 5:3). Historical boundaries often cut across the system of stone walls. Two of the early-Iron-Age farms are situated on or very close to later boundaries. Outside this investigation area, there are also examples of parish boundaries of mediaeval or earlier origin which cut through prehistoric farm complexes (Skinstad, Skärkinds sn/Särstad, Gistad sn, Klett 1979; a map of Skinstad is also published in Nordén 1943). Major changes in the agrarian structure thus occurred in the area between the two cross-sections. The boundaries of the historical hamlets were established; a two-field system was developed, and the settlement form changed from single farms to hamlets. In the following pages some of the stone-wall localities will be analysed in an attempt to date the different changes.
Hässelstad
This area has been disturbed by recent activities (gravel-working, cultivation and the site of an open-air festival) and no surface remains of prehistoric settlement were found. The arrangement of stone walls suggests, however, that a settlement existed in the central area or maybe at the present farm site in the north-eastern part of the area. Three cattle paths lead into the central pasture area. The land use is most easily interpreted in the southern part, where a cattle path opens out towards a large, unenclosed area, today covered with forest. East and west of this cattle path, there were enclosed, infield areas. The two cattle paths leading south-west and south are both intersected by a historical boundary. They were apparently already disused in the late Iron Age. The southern cattle path is blocked by some late-Iron-Age graves (Raä Skärkind 12; notes by Winberg, 27 June 1980). The southern cattle path, which connected Hässelstad with the pastures in the south, is partly overlain by the Skärkind 74 cemetery, which is dominated by late-Iron-Age graves (Fig. 5:1). In the late Iron Age, the settlement at Hässelstad thus had no connection with the unenclosed lands in the south.

Kopparslagarbacken, Lundby
A distinct house-platform is centrally located in this stone-wall area. Mounds of split stone with prehistoric pottery on the surface were found close to the platform. The arable land was situated south of the settlement, while a part of the elevated land north of the settlement served as a green. The most distinct, cattle path, with double stone-walls and clear signs of soil erosion on the slopes, leads northwards on the eastern side of the hill. In the northern part of the area, a sunken track bounded by a stone wall on one side leads down the hill to the former wetlands in the north. A large cemetery is situated north-east of the

The following interpretation is suggested. During the late Iron Age, lands in the early-Iron-Age settlement at Hässelstad were divided between Hässelstad and Alvestad (situated some 1000 m SW. of Hässelstad). The cattle paths leading south went out of use. At Hässelstad, the Skärkind 12 cemetery was in continual use and gradually blocked the older cattle paths. At Alvestad, the Skärkind 74 cemetery was established. The locations of both cemeteries close to the boundary suggest that they served as territorial markings.
house platform (Raä Skärkind 19). It contains 55 graves of various forms, suggesting that it was in use at least during the whole of the first millennium A.D. The oldest graves (runda stensättningar med mittröse) are located centrally, north of the house platform. The cemetery exhibits a clear, horizontal stratigraphy, and a number of late-Iron-Age graves (högliknande stensättningar, högar) are located in the south-eastern part. Through the group of late graves leads a sunken road, from the house platform to a small water-hole in the east, limited by a stone wall on its southern side. The cattle path is not blocked or destroyed by the construction of the graves, which would have been natural if the house platform and the cattle path had been disused at that time. The site may thus have contained a settlement not only during the early Iron Age, but also during a large part of the late Iron Age.
Skärkinds prästgård (Dövestad) (Lindquist 1968:48, 134; Klang & Widgren 1973). This locality was probably settled up to the 16th century, when the Dövestad farmstead was abandoned and united with Hattorp to form the presbytery of Skärkind (Klang & Widgren 1973). To judge from the names, Dövestad is the oldest of the two units and has a prehistoric origin († Døvestadhom, A.D. 1380, SRP Nr 1508), while Hattorp probably belongs to the group of avgärdatorp which characterised the late Viking Age and early mediaeval expansion. The fossil landscape in Dövestadhagen (Fig. 5:4) thus has a very long history. A field lynchet in the northern part has yielded radiocarbon datings in the first two centuries A.D. (Klang & Widgren 1973). Most of the stone walls probably date from the early Iron Age.
They knit together lands from four historical hamlets. Both the early-Iron-Age farmstead and the mediaeval Dövestad were located in the southern part of Dövestadhagen, where house foundations and high phosphate concentrations have been found.

The development is interpreted as follows. The early-Iron-Age farm used the lands of the historical Hagelstad (the western cattle path opens out to this hamlet) and Kätterstad (infield boundary NE. of the settlement, Fig. 5:7). The farm may well have been continuously settled during the late Iron Age—a cemetery was established in close proximity to the settlement during the late Iron Age, on what was probably a previously cultivated field (Raå Skärkind 90, notes by Winberg, 5 Sept. 1979). During this
period, the historical boundaries within the area were established. On the lands of Dövestad, the avgårdatorp of Hattorp was later established. The two-field system evidently developed during a period when the two farms co-existed. The map of 1705 (on which Fig. 5:5 is based) depicts a relict system of fences and land use; around the then deserted farm of Dövestad the arable fields are still identifiable.

The two-field system developed in an intricate way. Not two, but four main enclosures are found on the 1705 map. The location of the oldest farm site at Dövestad (Iron Age to 16th century) was motivated by the nearness to moist meadows to the north and east and to small, well-drained patches of arable land around the hill, while that of the later site at Hattorp (early mediaeval times to the present) was motivated by the adjoining, large areas of well-drained soils, suitable for arable farming. When the two farms were united in the 16th century, the Hattorp site had become the more central. The situation of Dövestad–Hattorp can be compared with that of its eastern neighbour Kätterstad, whose historical settlement is located centrally in between the two arable fields, while its wet meadows are found in the northern part of its territory.

**Kvästad mellangård.**

Directly connected to the north-eastern stone walls of Dövestad lies another abandoned farm. At the laga skifte enclosure in 1852–53, a farm was moved here from Kvästad hamlet. Large parts of the stone walls have therefore been destroyed by recent activities, but a map by Edlund (at the A.T.A., drawn probably around 1920) makes possible a reconstruction of the site (Fig. 5:6). From the north-east a fossil cattle path leads up to the present farmstead. The farm was located at the junction between an infield area in the south-east and unenclosed lands in the north-west and there was thus no need for a long cattle path. It served only to gather the animals in a small, enclosed green close to the settlement. There are no prehistoric house-platforms or other evidence of buildings at this site. The most probable site of the farmhouses is where the main farm-buildings are now. East of the site, further stone walls are found, but their function is uncertain; large parts have probably been cleared away.

The Skärkind 83 cemetery, 500 m SE. of the site, is dominated by late-Iron-Age graves (högliknande stensättningar, högar, treuddar). In its northern part, it overlies a stone wall and a sunken track.
Augustehill, Viggeby
(Lindquist 1968:30 f.)
About 1 km east of Kvästad Mellangård, the largest concentration of stone walls in the investigated area is located. It is divided by a later by boundary and lies partly on the lands of Kvästad and partly on those of Viggeby. As at Kvästad Mellangård, the laga skifte enclosure in the 19th century led to the establishment of a farmstead on the prehistoric site, but most of the stone walls were preserved. A full documentation of this site will be found in Lindquist’s work (1968:30 f.). He also carried out phosphate mappings and pointed out two possible settlement sites. To judge from the topography, the present farmstead or the area just north-west of it are the most probable sites. A settlement may also have existed in the western part of the area. Three cattle paths lead out from the central green—a western one towards Kvästad, a northern one towards the historical hamlet of Viggeby and an eastern one towards the
unenclosed pastures in the east. The later one was cleared away in 1905 (Edlund, A.T.A.), but a concentration of stones is still to be found in the arable land (pers. comm. from the farmer, Gunnar Olai, Augustenhill). The opening of this cattle path will be found east of the present arable. About 100 m east of the opening, a possible house-platform is located, together with two short, parallel, stone walls (marked Viggeby on the map, Fig. 5:7). The platform may be evidence of settlement during prehistoric times. A newly found cemetery of early-Iron-Age type (Raä Skärkind 304) supports this assumption, but the platform has no functional connection with the system of stone walls. The interpretation of this site is unclear and it is not entirely out of the question that it represents recent activities at a croft located only some 50 m further east (Ekonomisk karta 1877).

Spolstad, Gårdeby parish
The stone walls at Spolstad belong to the western part of the settlement in Gårdeby parish and are separated from the rest of the investigated area by outlying lands. They will be treated in section 5.2.

Conclusions
In the western part of the area, further stone walls are to be found, but no positive evidence of settlement has been documented. The stone walls in the central part of the parish—around the church—are only fragments of a previously much larger system and the area, no doubt, contained more settlements than those described.

The four sites with positive evidence of settlement (Skärkinds prästgård, Kopparslagarbacken, Kvästad Mellangård, Augustenhill) thus represent a sample of the contemporary landscape, but the sampling process is not under the research worker’s control—it is carried out by later developments in the area. An attempt to study the processes of selection has been published elsewhere (Widgren 1982). This study implied that the investigated area contained some 40, theoretically possible, settlement sites, taking into consideration the requirements of soils within a radius of 500 m around the sites. The analysis showed that two-thirds of these theoretical sites had been occupied during different periods. In most cases, the latest phase of occupation had altered the site to such an extent that the earlier history of the site could no longer be assessed by field observation. Continuously occupied sites and later establishments thus probably covered further sites dating from the early Iron Age.

The area thus contains 28 potential sites, where early-Iron-Age farms may have been located, but later settlements have destroyed almost all evidence on 23 sites (Widgren 1982:311). The possibilities of estimating the density of prehistoric settlement are therefore limited in this area. The number of farms in the area during the early Iron Age may have been much greater than we can ever record today and all estimations must be regarded as minimum figures.

Concentrations of stone walls, without positive evidence of settlement, are to be found at Hässelstad (see above), at Fristad (1 km W. of Hässelstad), at Skävid and at Simonstorp (Fig. 5:7). If we take all these concentrations to represent early-Iron-Age settlements, we may conclude that at least eight farms have existed within the area of 25 km². If the large, outlying lands in the south-eastern part of the area are excluded, a density of one farm per 2 km² is reached. More detailed surveys of settlement sites would probably increase the number.

As regards the structure of the agrarian landscape, the results from the Skärkind area point to a complex interdependence between the farms. Where cattle paths have been documented, they usually connect the farms not only with pasture areas, but also with other farms. This suggests large-scale co-operation, over stone walls and unenclosed pastures, between different farms. This network of stone walls and cattle paths has no relation with the later by territories.

At least three early-Iron-Age complexes, consisting of one or more farms and using the lands of two or more historical hamlets, can be identified: Hässelstad—Alvestad, Hagested—Dövestad—Kätterstad—Kvästad and Augustenhill (Kvästad—Viggeby). The first two had common pastures and the cattle paths of Augustenhill suggest that this complex was connected to the Hagestad—Dövestad—Kätterstad—Kvästad complex.

The late-Iron-Age graves that overlie stone walls show that at least parts of this spatial organisation were already changed during prehistoric times. Within the investigated area, such cases have been documented in three localities (Hässelstad, Alvestad and Kvästad). Similar stratigraphies are also to be seen at Viskeryd, Vårdsberg parish (Raä Vårdsberg 32), and at Skinstad, Skärkind parish, where stone walls running up a hill have been cut off by the construction of late-Iron-Age graves (Raä Skärkind 36, Klett 1979:11). The opposite stratigraphy has also been noted (Eggeby, Raä Skärkind 31, Klett 1979:11 and possibly at Kätterstad, Skärkind 79). Stone walls were apparently still in use in the late Iron Age, but the striking fact is that so many large complexes show such a clear break already during or before the late Iron Age. Territories, land use and many settlements were radically changed during a rather short period. This points to a clear break in the structure of the agrarian landscape.
5.2 Gårdeby

5.2.1 Landscape and settlement changes

The high density of farms in the early Iron Age and the subsequent, very radical restructurings of the agrarian landscape are clearly illustrated in the central parts of Gårdeby parish, immediately east of Skärkind (see map, Fig. 1:6). The parish forms a closed unit, with the agricultural land as an almost circular area totally surrounded by woodlands. This is also reflected in the arrangement of stone walls, which contrasts sharply with that of the more open plains in the west.

The map (Fig. 5:8) is based on material from the 1979 survey of ancient monuments (kindly placed at my disposal by Björn Winberg, Raä) and on a compilation of 17th- and 18th-century maps. As can be seen on the map, the northern, western and southern peripheries of the agricultural lands are fringed by a dense network of stone walls, forming the outer boundary of the prehistoric cultivation. The central part of the area seems to have served as a large, common infield to many farms. Centrally in this kettle, on the lands of Skyllinge, lies a large, dominating hill, which is also covered with stone walls and other traces of settlement.

In the Gårdeby area, I have carried out only a partial field survey of possible settlement sites. However, the evidence from the Fläret and Skärkind areas permits of the drawing of some conclusions as to the minimum number of farms in Gårdeby during the early Iron Age.

The lands of the historical Berga by probably contained at least two early-Iron-Age sites. The large cemetery—dominated by late-Iron-Age graves—also contains early graves, stone walls and two terraces, one of which is a possible house-platform. Most probably this site represents an early-Iron-Age settlement which has been partially overlain by late-Iron-Age graves. Some 400 m to the south-west a cattle path opens out to the woodlands. At the limit between the infield and the outlying lands, an enclosure is situated. Inside the enclosure the ground is stony; it has never been tilled and was probably used to pen cattle. The cattle path leads towards the infield area and one would expect to find a settlement site in the south-east, but stone-quarrying has erased all traces.

The stone walls north of Spolstad contain a short cattle path running north-east to south-west, two small enclosures—one of which shows clear traces of cultivation (see Fig. 5:10)—and a possible house-platform at the southern end of the cattle path. The spatial organisation of this site is a clear parallel to

Kvästad Mellangård (cf. section 5.1)—a settlement at the junction between infield and pastures. The stone walls south of the historical farm of Spolstad may indicate that also this site was inhabited during the early Iron Age.

I have not completely surveyed the vast systems of stone walls on the lands of Åkerby in the field, but, to judge from the complexity and length of the walls, it seems reasonable to think that they represent at least two farms. It seems unlikely that one single farm would have produced such a large system.

The large hill on the former lands of Skyllinge (now under Berga) contains an abundance of stone walls, lynchets, platforms and surfaces cleared of stones. The hill probably served as a green, delimited from the lowlying, clay lands by the two longest, stone walls. Two house platforms—150 m apart—situated in the central parts of the hill should probably be interpreted as separate farms.

From the analysis above, a number of six to eight farms connected with the stone walls seems a reasonable minimum estimate. The total length of the stone walls in the area and the enclosed area lends some support to this estimate. We can assume that the vast majority of the 10.8 km of stone walls served as barriers. Evidence from 14 different villages and hamlets in the 17th century, most of them practising an infield system (ensäde), shows that the total length of fences per farm was between 0.8 and 4.1 km, with a median at 1.5 (Myrdal 1975, based on Erixon 1960). The high values refer to villages with complicated field systems (four-year rotation, for example) and many enclosures. The quotient of 10.8/1.5 suggests that the stone walls remaining today in Gårdeby represent seven farms.

A similar figure is reached from the possible infield area in Gårdeby during the early Iron Age, which can be delimited in the north, west and south by stone walls and in the east by a line drawn approximately through the Skyllinge settlement. The area amounts to 250 ha and if an infield area of some 30 ha is assigned to each farm (cf. section 3.2), this would give a total number of eight farms.

The single graves and cemeteries in connection with the stone walls are generally typical of the early Iron Age (kvadratiska stensättningar, stensättningar med mittröse eller mittsten, reste stenar och stor diameter). The Gårdeby 6 cemetery on Berga contains some graves of this type but is dominated by late graves. It was probably in use during the whole Iron Age. Another exception is the western cemetery at Skyllinge (Gårdeby 11). The graves are small (5 m) and some of them are covered with turf, but they lack the typical bowl-form (Sw. välvd) of the late Iron Age. A late dating seems out of the question. On the map (Fig. 5:8), this cemetery has
been classified as belonging to the older group.

Some of the graves and cemeteries in the early group may well be of pre-Iron-Age origin. The large, flat, cairn-like graves at Gårdeby 11 and Gårdeby 7, for example, are usually associated with the Bronze Age or the early pre-Roman Iron Age (Selinge et al. 1976). A similar grave is to be found centrally in the Fläret area (Fig. 2:20) and it is perhaps not a coincidence that such graves have such central positions in early-Iron-Age, settlement areas. They may mark the centres of territories which originated in the late Bronze Age and which were finally split up in the late Iron Age.

The late-Iron-Age graves are concentrated in four cemeteries, each of them within the territory of a different historical hamlet. Of the hamlets with prehistoric names, only Össby lacks a late-Iron-Age cemetery. There is also a certain correspondence between the number of farms in the 18th century and the number of graves within each hamlet (Table 4).

<table>
<thead>
<tr>
<th>Hamlet</th>
<th>Cemetery</th>
<th>Late-Iron-Age graves</th>
<th>Number of farms 18th century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berga</td>
<td>Gårdeby 6</td>
<td>50</td>
<td>6</td>
</tr>
<tr>
<td>Spolstad</td>
<td>Gårdeby 2</td>
<td>35</td>
<td>2</td>
</tr>
<tr>
<td>Skyllinge</td>
<td>Gårdeby 8</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Åkerby</td>
<td>Gårdeby 14</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Össby</td>
<td>-</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4. Hamlets and late-Iron-Age cemeteries in Gårdeby parish

The cemetery at Åkerby (Gårdeby 14), which has the lowest number of graves, is surrounded on all sides by cultivated fields and is also recorded to have been damaged by recent cultivation. Recent cultivation very close to the graves at the Skyllinge cemetery indicates that this cemetery also may have been damaged. The original number of graves may thus have been greater in both these cemeteries.

Berga, which has the largest cemetery within its boundaries, had in the 18th century a complex pattern of settlement and fields (cf. the map LMV Gårdeby 9). The settlement was located on two different hills. The eastern, Stora Berga, was finally abandoned during this century. The lands of Stora Berga and Lilla Berga were partially intermingled. To judge from the number of graves, this was already a large unit at the end of prehistoric times and it is typical that the regulations and concentrations of settlement during the late Viking Age and early mediaeval times left so few traces in this unit (cf. Helmfrid 1962:220 ff.).

From the evidence of stone walls and cemeteries, it is possible to suggest a settlement chronology within the area. Skyllinge may have been settled during the Bronze Age or the pre-Roman Iron Age. Single farms were established on the periphery of the area during the early Iron Age. The historical territorial units seem to have been demarcated during the period A.D. 500–1000, although the dates of settlement at the historical hamlet sites in the central area are still uncertain.

Place-name historians work with a more or less established chronology of the names ending with -inge, -stad, and -by. This suggests that -inge was productive from an early part of the Iron Age, that -stad was productive from the first centuries A.D. and that -by was productive from the late Iron Age (Pamp 1970:61 ff.; Ståhl 1970:36 ff.; cf. also Franzén 1937:5–39).

The original forms of the names in Gårdeby have not been studied, but it can, at least preliminarily, be noted how well the place-name chronology agrees with the proposed settlement chronology. The only -inge name denotes the supposedly oldest centre. The only settlement still located on the periphery of the infield—a location which seems to have been typical during the period up to A.D. 500—carries the name Spolsstad, while Åkerby may represent an establishment on the former infield during the period A.D. 500–1000. The place-name Össby suggests that it is secondary to Åkerby (located east of something). The fact that this hamlet lacks a prehistoric cemetery within its territory may thus be explained. It may have been established during the last part of the Viking Age or later.

Between the two periods when we can record settlement locations (early Iron Age and 18th century), a shift inwards of the settlement have occurred. Most of the historical hamlets and their arable lands have a more central location in the infield area than the early-Iron-Age farms. While the early-Iron-Age farmsteads were located on the outer boundary of the infield, close to pastures (Berga, Spolstad and Åkerby) or in direct connection with wetlands (Skyllinge), the historical farms (especially Åkerby, Össby and Berga) are located closer to large areas of naturally drained but clayey soils suitable for arable farming.

The date of this change cannot be inferred from the evidence available, but the close association between the historical hamlets and the late-Iron-Age cemeteries is evidence that at least the hamlet territories, if not the exact running of the boundaries, had already been established in the late Iron Age. Together with the Skärkind evidence, this clearly shows that the historical hamlet territories were established by the splitting up of larger territories some time during the period A.D. 400 to 700.
Farms and hamlets (18th century)
Late-Iron-Age cemetery
Early-Iron-Age cemetery
Single graves
Stone walls
Boundary (18th century)

Fig. 5: The Gårdeby area. The early-Iron-Age graves and cemeteries are located in connection with the stone walls. Each historical by-territory, except Össby, has one late-Iron-Age cemetery. Scale 1:15 150.
Fig. 5.9. Stone wall locality c. 600 m N. of Spolstad, Gårdeby parish (cf. Fig. 5.8). The site is located at the junction of enclosed lands in the SE. and large, unenclosed areas of till and bedrock in the W. Photograph from the ESE.

Fig. 5.10. Same area as in Fig. 5.9. A small, oval-shaped plot, cleared of stones and enclosed by low stone walls. From the SE.
5.2.2 Population development

Discussions on Iron-Age-settlement problems in eastern central Sweden have often come to be centred on population problems (Ambrosiani 1964:202–208, 1973, 1980; Welinder 1974, 1975; Hyenstrand 1974:87 ff.). Many of the estimates of the late-Iron-Age population have either been based on assumptions as to the size of the settlement (single farm or hamlet) or been used to support a standpoint on this problem. The view held by Ambrosiani—that the settlement during the late Iron Age mainly consisted of one single farm within each historical-hamlet territory and that the settlement in byar was developed later—has as its logical consequence a rather small population during the late Iron Age. The population in the Vendel period (A.D. 550 to 800) that Ambrosiani reckons with in the Målar-Valley area (Ambrosiani 1980) is very low and if the figures for the end of the prehistoric period (c. A.D. 1000) that Hyenstrand (1974:88) and Friberg (1974:15) have calculated from different sources are correct, this presupposes a population growth of more than 4 % per year during the period A.D. 700 to 1000.

The discussion on the Iron-Age population has been centred on the Målar provinces (Uppland, Södermanland, Västmanland and Närke), where the investigations of cemeteries have been extensive, while the settlements and farm lands during the Iron Age are less well known.

In Östergötland, the high density of abandoned settlements and the large areas of enclosed lands during the early Iron Age point to a numerous population. Gårdeby provides possibilities of quantifying this statement and comparing it with results obtained by methods based on the cemeteries. It is a closed unit, its boundaries are set by nature, and it has been less altered by recent activities than the Skärik area. The late-Iron-Age cemeteries can therefore be used with greater certainty for population reconstruction. Good opportunities also exist...
Fig. 5:12. Population development in Gårdeby parish, according to different methods of calculation.

for discussing the population trend from historical figures, since an early population roll has been analysed by Friberg (1964). Three independent methods of calculating the Iron-Age population have thus been used here. Each of them has limitations (Welinder 1979:32 f., 68 f.), but they are based on three different types of sources and each underlying assumption is only used in one of the methods. The aim of the calculations is to compare the preliminary results of settlement density and structure, based on abandoned settlements and stone walls, with other types of source material (Fig. 5:12).

**Early-Iron-Age population (c. A.D. 300)**

For the early Iron Age, an approximate figure for the population can be obtained from the number of settlements. If each settlement consisted of eight to ten individuals (cf. section 3.2), the six to eight settlements in Gårdeby would correspond to a population of between 48 and 80 persons. The settlement size of eight to ten (corresponding to six full-consumption units) was assumed in section 3.2 without any evidence from the research area, but the simulation showed that a larger farm population would not allow of the density of farms actually recorded. Smaller numbers may, of course, be discussed, but a figure of less than six persons on each farm—corresponding to a minimum population of 36—have little support in the literature, except at specialized sites, such as the Ullshelleren rock shelter (Odner 1972).

The graves and cemeteries dating from the early Iron Age are less well suited for population calculations, because of their long period of use and the possibility of early graves being overlain during the late Iron Age (see Lundström 1970:70).

**Late-Iron-Age population based on graves**

Methods of calculating the population from the number of recorded graves have been developed in Sweden by Ambrosiani (1964, 1973) and Welinder (1979). The total number of recorded graves in late-Iron-Age cemeteries in Gårdeby is 130. The figure should be considered to be a minimum, since some graves may have been destroyed by late cultivation.
From the number of 130, corrections have been made to obtain the total number of deaths in the population using the cemetery during the late Iron Age. The number of burials at a totally excavated cemetery usually amounts to twice the number of graves recorded before excavation (Ambrosiani 1973). Osteological investigations have shown an under-representation of women in the graves during most periods of Swedish prehistory. During the late Iron Age, the ratio has been calculated as 1.6 in favour of men (Welinder 1979:116). Corrections for the number of infants (0–14 years) have also been made. The average proportion of infant graves in late-Iron-Age cemeteries is only 5 per cent (Welinder 1979:116). Higher values have been shown at one cemetery in Östergötland (Ambrosiani 1973, based on Lundström 1965), but in the following table the average values based on a larger number of cemeteries in eastern central Sweden have been used. The number of infant deaths can be assumed to have amounted to 60 per cent of the total mortality (Ambrosiani 1973:128, Welinder 1979:96).

In Gårdeby, the following calculations can be made:

A Recorded graves 130
B Number of burials 260 (2×A)
C Number of male burials 160 (1.6×B/2.6)
D Corrected value, incl. women, 320 (2×C)
E Adult deaths (D−5%) 304
F Total number of deaths 760

(assuming that child deaths were 60% of F)

The total number of deaths in the population using the cemetery can then be used to calculate the population if the life expectancy at birth and the period of use are known. It must, however, be stressed that groups of people may have existed who were not entitled to be buried in the cemetery (cf. Selinge 1977:345 ff.).

If the life expectancy at birth is assumed to have been 20 years (Welinder 1979:92) and the cemetery was in use from A.D. 600 to 1000, the population using the cemetery can be calculated as 42 persons (using the formula given in Welinder 1979:61). This refers to the whole period and if an annual growth rate of 1.6% is assumed, it corresponds to c. 58 persons in A.D. 1000.

Population trend based on historical figures
The population of Gårdeby in 1686 has been reconstructed from an early population roll by Friberg (1964). It amounted to 300 persons. On the basis of an earlier taxation list (Alvsborgs lösen 1571), the population at the middle of the 16th century can be calculated as some 200 persons (Friberg, pers. comm.). The figures point to a rather rapid increase during the 17th century (3–4 %), which probably exceeded that of mediaeval times.

In a reconstruction of the population of the Mälar provinces in A.D. 1000, Friberg found that the annual growth rate increased gradually during the period A.D. 1428 to 1750, but that 1.6% was a good estimate for the whole period. This was based on documentary evidence from the 14th and 15th centuries (Friberg 1974). The population during the last millennium of prehistory has been estimated to have doubled in 500 years (corresponding to an annual growth rate of 1.4 %) on the basis of the number of graves (Welinder 1975:72).

The curve plotted in the diagram (Fig. 5:12) is based on a population growth of 1.6 % and starts in the 1686 values, which are the earliest, precise figures. For the period covered by the curve, this growth rate should be seen as a mean value. The curve thus shows a possible long-term development. In reality, periods of rapid increase, as well as population disasters, have occurred (Welinder 1979:39 ff.).

As might be expected, the different methods give different results. The late-Iron-Age population, as calculated from the cemeteries, is small, compared with the trend calculated from historical figures. To give an example of the range of the difference, one may say that it corresponds to 92 graves being destroyed during historical times or to 40 per cent of the population being excluded from burials at the cemeteries (besides those discriminated against on the grounds of sex or age) or that it means that the cemeteries were in use for c. 200 years instead of the calculated 400.

The values for the early Iron Age, as calculated from the number of settlements, are high, compared both with the trend and with the late-Iron-Age graves. This may be due to wrong estimates of the number of settlements, but one cannot neglect the possibility that the Roman Iron Age actually represented a peak in the population development, with values at the same level as during the late Iron Age (cf. the high values of cereal cultivation, subsection 4.2.4). Similar evidence has led Cunliffe to discuss the possibility of a population in Britain during the Iron Age and the Roman period greater than that of mediaeval times (Cunliffe 1978). In the Jæren region Myhre reckons with a population during the 4th and 5th centuries of the same size as that of the 17th century (Myhre 1981:137). However, such dramatic figures are not supported by the present evidence from Östergötland.
5.3 Agrarian changes during the Iron Age: Some conclusions

The results with respect to the changes in the structure of the agrarian landscape can be summarised in three cross-sections of a hypothetical landscape (Fig. 5:13):

**A.D. 400.** Settlement consisted of single farmsteads united by a common, stone-wall system to form large complexes (3–7 km²). The settlement form of single farmsteads was developed within the framework of an earlier, territorial organisation, which had its origin in pre-Roman times or earlier. The single farmstead with its intensively tilled arable formed the basic element in the system. The arable formed a minor part of the enclosed lands, which were mainly made up of wetlands used for haymaking. Many farms had a share in the same infield and the pastures were used in commonty and probably shared between the different complexes.

**A.D. 700.** In the period A.D. 400 to 700, the stone-wall complexes were split up and the historically known, by territories were shaped. This division of the land lies incongruously over the old, land-use pattern and implies a radical restructuring. Lands formerly knit together by cattle paths and pastured in commonty were now divided. Even the former infields, with their large, wet meadows, were divided between different byar. Neither the settlement location nor the farming system of the period is known, but the arable still formed a rather small proportion of the total area. Some of the sites may have been abandoned during the agrarian crisis in the 6th century, while others may have been moved to new sites within the by territory as a consequence of the restructuring. Each by territory had its own cemetery, which may have been located centrally within the territory but may often also have been located close to the newly established boundaries.

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**Fig. 5:13.** Three hypothetical cross-sections of the development of agrarian landscape. The shaded lines denote fossilised forms. In the last two stages, no fences have been drawn.
A.D. 1700. As concerns the settlement patterns and field layout, the 18th-century landscape is mainly a product of the late-Viking-Age and early-mediæval re-organisations connected with the introduction of the two-field system and the solskifte regulations of the arable land and settlement. The concentration of the settlement in a common bytont was also completed during this time. The hamlets were centrally located within the arable land and with direct access to both fields in the two-course rotation.

Size of the stone-wall complexes

The area of each complex must be sought somewhere above the average size of the historical, by territories (1.8 km²; Lindquist 1968:118). Although their outer limits are seldom clear, it is possible to form some idea of the sizes of these territorial units from the field evidence.

The Fläret area is delimited in the south and east by large areas of till and bare bedrock, which are unsuitable for farming, and in the north by the infiel boundary. In the west, the delimitation is more difficult, but an area of 5-6 km² (including common pastures) is a reasonable estimate. The three identified complexes in the Skärkind area cover some 2–3 km² each (section 5.1) and in the Gårdeby area, nature has provided boundaries for a complex measuring 7–8 km² (section 5.2).

Areas of similar sizes have previously been identified as resource areas for units with a common cemetery during the early Iron Age. In Uppland and Södermanland, Ambrosiani found that the cemeteries were often located at a distance of 2–3 km from each other (Ambrosiani 1964:193), corresponding to an area of 3–7 km². In Östergötland, Nilsson has shown that pre-Roman and early Roman cemeteries were located at a distance of 3 km (Nilsson 1977:117).

Origin of the stone-wall complexes

In 1968, Lindquist regarded the emergence of village-like complexes in Östergötland during the first few centuries A.D. as having been caused by the gradually increased cooperation of isolated farmsteads (Lindquist 1968). However, in 1974, he showed how a similar, agrarian landscape on Gotland was established within territories that were already used communally by a large group during the period 500 B.C. to A.D. 100 (Lindquist 1974). The communal traits in the agrarian organisation were thus already present before the re-organisation c. A.D. 100. The territorial continuity on Gotland between the Bronze Age and pre-Roman territories, on the one hand, and the Roman-Iron-Age, stone-wall complexes, on the other, has also been underlined by Carlsson (1979:158).

The stone-wall complexes thus probably have their origins in a much older, territorial organisation. Nilsson proposes that an earlier, village-like type of community during the pre-Roman Iron Age may have been the prerequisite for the functional organisation manifested in the loosely grouped settlements in the stone-wall complexes (Nilsson 1977:120). The emergence of the stone-wall complexes must thus be seen as having been caused by a new farming system within the framework of an earlier social and territorial organisation, rather than by the gradually increased cooperation between landnam farms. I have already pointed out that many of the large, stone-wall complexes have graves of possibly Bronze Age origin centrally located within their areas (section 5.2). A division of land between different social territories thus preceded the emergence of the stone-wall complexes.

Causes of the decline

During the expansion period, the number of farms increased. This took the form of (1) an inner colonisation within the former territories and (2) an expansion into marginal woodlands (see the references in section 4.4).

In the central parts, the density of the farms may have been so great that each farm had at its disposal a total area of only 1–2 km². To judge from the abundant occurrence of stone walls, the area of the enclosed lands reached almost the same proportions as during the 17th century. As was shown in subsection 5.2.2, the population may at that time have exceeded that in the late Iron Age.

The expansion reached a peak during the 3rd and 4th centuries A.D. (subsection 4.2.4). A development of farming by the establishment of more farms in the central part was then no longer possible. An increasingly intricate set of rules and agreements within the local communities of farms with common infields and between different communities must have been a natural consequence of this intensification. As suggested in section 3.3, these regulations at the different, territorial levels may have been the basis of the ecological stability of the farming system.

Once the cultivated area was related to the amount of pasture and meadow land, the farming system may have been a very stable one, since the main problem of supplying the cultivated area with nutrients could be coped with. But an endeavour to increase production in the cultivated area on a single farm and thus increase the stock to supply the manure would have consequences for other farms within the community and also for other farm complexes using the same common pasture.

More radical changes of the farming system, such as adding new elements to the structure or establi-
The establishment of the by territories

During the late Iron Age, the large, stone-wall complexes were split up into the smaller, historical, by territories which have since then characterised the area. This process has parallels with the development described by Ambrosiani in Uppland and Södermanland (1964:212 ff.), where large early-Iron-Age units were partitioned into the subsequent by territories during the late Iron Age. There is, however, one important difference. Ambrosiani presupposes that, both in the early and in the late Iron Age, each territory included only one farm (1964:202 ff.). The partition is mainly seen as reflecting an increase in the number of farms. Similar views are presented by Hyenstrand (1974:37–38).

The evidence from Östergötland, however, shows that a partition into new territorial units must not be interpreted as having been caused by the division of one original farm, but rather by a restructuring of the forms of cooperation between many farms within an earlier territory.

If the number of farms was only slightly reduced in connection with the 5th- and 6th-century decline, the shift may have led to the establishment of byar. If, on the other hand, the number of farms was heavily reduced, it is more reasonable to regard each late-Iron-Age territory as having contained only one single farm. The interpretation of this shift is thus dependent on the scale of the settlement desertion.

The previous estimate of settlement desertion in Östergötland lacks a basis and is probably too high (cf. subsection 1.2.3). We still, however, have to reckon with a break in place continuity on a large number of sites during the period A.D. 400 to 700. But, as was shown in section 5.1, some of the sites (Skärkinds Prästgård and Kopparstugurahbacken) may well have been continuously settled into the late Iron Age, while their lands and territories were radically changed. The shift from dispersed, single farmsteads during the early Iron Age to the hamlet settlement of mediaeval times may thus have been gradual.

The models presented by Lindquist (1968:122 ff.) and Hannerberg (1977:139 ff.) presuppose that more than one settlement site existed within the by territories during the late Iron Age. Helmfrid has also given examples from the western part of Östergötland of such archaic settlement forms of many single farmsteads within one by territory, which are probably of late-Iron-Age origin and have survived the late-Viking Age or early-mediaeval re-organisations caused by the introduction of the two-field system and the solskifte (Helmfrid 1962:168,213).

As regards the problem of settlement-area continuity, no investigations have been made in Östergötland. At the present stage, it is thus not possible—on the basis of the archaeological evidence—to judge whether the desertion of a certain number of sites represents a heavy reduction in the number of farms or whether most farms were moved to the historical-hamlet sites.

Under all the circumstances, the splitting of the early-Iron-Age units into the by territories meant a radical change in the forms of cooperation between farms and between different units. Whether the settlement form was single farms or hamlets, the role of the single farm was strengthened, as compared with the intricate interdependence between the farms in the early-Iron-Age complexes and between different units. The most radical change was in the changed pasture organisation, which in the older landscape stretched over large areas and was manifested in the long cattle paths between different settlements.

Changes in settlement location

The settlement location in relation to different soils has not been deeply analysed in this study. Simple statistics of the distribution of soils with different textures (till, clay and bedrock) within a radius of 500 m from some abandoned sites in the Skärkind area showed no differences, as compared with the historical-hamlet sites (Widgren 1982, Tables 5 and 6 in this work).
A more detailed analysis might show differences as regards the drainage and the slope of the lands surrounding the sites. The settlements of Fläret I and II (section 2.4, see also Fig. 5:14), Skyllinge (section 5.2), Skärkinds prästgård (section 5.1) and Skinstad (Nordén 1943:31, Klett 1979) are all located close to poorly drained, clay lands, which before the present century were used as meadows. At these sites, the areas of cultivable, naturally drained land are confined to the narrow rim of sandy soils around the hills. Their location seems to have been guided by their proximity to wetlands. On these sites, it was not possible to cultivate the large areas needed in a two-field system without extensive drainage.

Furthermore, Kvästad mellangård (section 5.1), Nygård III (section 2.4) and most of the sites in Gårdeby (section 5.2, Fig. 5:9–11) are examples of

<table>
<thead>
<tr>
<th>Hamlet</th>
<th>Clay %</th>
<th>Till %</th>
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sites located on the outer limit of the infield area, close to large areas of till and exposed bedrock, which have served as pasture land.

On the other hand, in the Gårdeby area, it was shown how the historical sites were located more centrally in the infield area (section 5.2, cf. Fig. 5:15). This possible change in locational preferences—which still awaits statistical treatment—seems thus to reflect the increasing role of arable farming.

Similar locational differences between the early-Iron-Age and the historical farms have been found on both Öland (Königsson & Königsson 1976) and Gotland (Arrhenius 1955, Carlsson 1979:91). Carlsson also interpreted the shift of the settlement sites on Gotland during the 6th century as having been caused by the introduction of the two-field system (Carlsson 1979:146). This very early dating of the two-field system, however, still remains to be proved.

The increasing role of arable farming and the demands for large areas of well-drained, cultivable land thus can explain the difference in location between the early-Iron-Age sites and the historical, but it cannot—in the present state of our knowledge—be seen as the immediate cause of the settlement changes in the 5th and 6th centuries.

In a somewhat longer, time perspective—say, A.D. 500 to 1200—it is, however, clear that we are dealing with a process of (1) amalgamation of isolated patches of arable land into larger fields and (2), as a consequence of that, a concentration of settlement from single farmsteads to hamlets and villages.

As regards the origin of the large, open-field villages in Europe, there seems to be growing evidence of such a process during the period under discussion, a process which ended in the shaping of the villages in their known, mediaeval form some time in the period 900-1200 (Dodgshon 1980:65 f., Hall 1981, Harvey 1981, Grøngaard Jeppesen 1981).

On the island of Funen, the territories of the mediaeval villages may have already been demarcated during the early Iron Age, while the settlements
at the mediaeval sites have their origins as late as the 10th, 11th or 12th centuries (Grøngaard Jeppesen 1981:146).

Although the process in central Sweden is a parallel to this development, the effect on the size of the territories was disintegrative. The physical landscape in most cases prevented the development of large, open fields on the basis of the early-Iron-Age territories. There were simply no areas of well-drained soils of that size available close at hand. The endeavour to amalgamate arable land into larger fields thus resulted in two or more different areas of common, arable fields within each former territory.

This process may explain the difference in location between the early-Iron-Age sites and the historical ones. It may, furthermore, explain the splitting up of the early-Iron-Age territories. However, it is not possible to claim that these changes started as early as the 6th and 7th centuries. To judge from the retrospective analysis by Hannerberg, the hamlets in Östergötland were then still characterised by some kind of ensäde spatial organisation (1977:148). The earliest, documented, settlement shifting in Sweden which may have been caused by the introduction of the two-field system has been dated by U. Göranson in the 9th and 10th century (Göranson 1977:110 ff.).

By saying this, I do not claim that it is impossible to explain the restructuring of the territorial division in terms of agrarian technology and farming systems; only that the data for this conclusion are as yet lacking. It is still, of course, possible that the forms of arable farming underwent changes during the 6th and 7th centuries. Forms of regular fallowing may have been introduced without an increase of the yearly sown area. This would hardly be reflected in the pollen diagrams. The introduction of an iron ard-share may also have changed the conditions of arable farming during this period (Myrdal 1982:101), but its effect on the agrarian landscape remains to be studied.
The point of departure for this study was the inspiring contradiction between the two publications of the Halleby project, which on major issues differed in their conclusions (Lindquist 1968, Baudou 1973). The main question on which they differed concerned the dating of the stone walls and thus the emergence of village-like, farming units, with fixed boundaries between different types of land use and with a common infield and cattle paths. All the evidence produced in this study has supported the findings of Lindquist that this type of landscape had its origin in the first few centuries A.D. and that, on the whole, it can be dated to the period A.D. 100 to 500. This does not mean that stone walls were not in use after that period but that the stone wall complexes generally represent an agrarian structure which was already fossilised during the late Iron Age.

As to the structure of the agrarian landscape, Lindquist interpreted the early-Iron-Age units as consisting of some three farms with a common enclosure. He underlined the few changes in the structure of the agrarian landscape between the early Iron Age and early mediaeval times (1968:135, 137). It is mainly in the location of the settlement sites that the picture of the early-Iron-Age landscape (phase C) which Lindquist presented differs from the historically documented hamlets (phase E). According to him, the number of farms and the by territory have not been changed (Lindquist 1968:48, Fig. 1:3 in this work).

The maps presented in this study give evidence of a more complicated structure. In the period A.D. 100 to 500, the farms were knit together by a common network of stone walls over large areas—in complexes which, in general, were larger than the subsequent by territories.

In the Fläret area, the settlement and land use in such a complex was studied in detail (Chapter 2). The results of this investigation are summarised in Fig. 2.54. In this area, four or five single farmsteads cooperated in common enclosures and cattle paths. They formed a village-like type of organisation which covered an area of more than 4 km². Close to the settlement were small areas of arable land, which were intensively cultivated and manured. The greater part of the enclosed area was, however, used as wet or moist hay meadows (section 4.3).

The farming system practised in the area can be characterised as an infield system with enclosed meadows (Chapter 3). Some understanding of the functioning of this farming system can be gained from similar, historically documented systems. The key link in such systems is the flow of nitrogen from the grasslands to the small area of tilled fields. This was accomplished by (1) the collection of winter fodder on the enclosed meadows and (2) keeping the livestock close to the settlement at night-time, during the vegetation season. When the dung was collected and spread, it produced a net flow of nutrients to the arable land. There is reason to believe that there were at least three levels of decision-making in the local farming society: the individual farm, the hägnadslag ("enclosure society", corresponding to the whole, stone-wall complex) and the institution controlling the pastures common to many complexes. The two institutions above the farm level were of vital importance for the ecological stability of the farming system.

This farming system was established in the first centuries A.D. during a period of increased human influence on the landscape. To judge from the analysis of the vegetational development (Chapter 4), both arable and pasture expanded in the last centuries B.C. The establishment of the contrast between the two land categories of inägor and utmark by the laying-out of the long stone-walls in the first few centuries A.D. seems to come as the final product of this development. During the 3rd and 4th centuries A.D., the expansion reached a peak and a very open landscape was created. The Roxen plain was fully colonised and an expansion into the marginal woodlands occurred. In the central parts, the cultivated lands were evidently developed up to the limits of the farming system—or even beyond those limits; the pollen diagram from Lake Flären suggests that the expansion of pasture lands did not keep pace with the arable expansion. This may have led to a lack of manure and an over-exploitation of the arable. The following centuries saw a decline in agrarian production, but in the 7th and 8th centuries, both arable and pasture recovered. However, no radical changes in the proportions between different land-use categories can be documented, and it was not until after A.D. 1000 that the cultivation of cereals expanded markedly.

On the other hand, the basic structure of the agrarian landscape was already radically altered in
the late Iron Age (Chapter 5). Not only were many of the farm sites abandoned, but the large, stone-wall complexes were then split up into the historically known, by territories. The shift may have led to the establishment of one single farm or a group of 2-3 farms within each territory. In either case, the previous forms of cooperation between farms in the large, stone-wall complexes and between different complexes in the common pastures were radically altered.

In the first chapter, I asked to what extent this development could be understood mainly as reflecting changes in the farming system. Of the two periods of expansion that I have dealt with, the early Iron Age probably involved the most profound changes in the forms of farming. The expansion which is then witnessed in the pollen diagrams is clearly associated with the appearance of a number of different, but closely interdependent, agrarian innovations (section 4.4). The common denominator of most of these changes is the stalling of livestock and the use of their manure on permanent fields. The clearance of meadows for hay-making, the laying out of long stone-walls to enclose arable and meadow land and the establishment of cattle paths connecting the pasture with the settlement are all prerequisites for this integration of arable farming and cattle-breeding within one and the same farming system.

The spatial organisation of the stone-wall complexes can be seen as reflecting the introduction of this new farming system within the framework of an older, territorial organisation. Within these territories, the farms and the arable land were probably farmed individually, but the long cattle-paths indicate a pastoral organisation which encompassed all the farms in the complex.

As was shown in section 3.3, the main, material flows within such a complex were connected with the livestock. But to say that the economy was based on livestock would be an over-simplification. The products obtained from the arable land may well have made up the major part of the consumption. Furthermore, the possibilities of development of the farming system were all connected with the cereal production. Any further increase in the calorific output based on the livestock would demand a much larger area of land than the same increase in the cereal production. And all the evidence points to the fact that the central parts of Östergötland were fully colonised and that pasture gradually became scarce. Working time and technology set other limits—the amount of winter fodder that it was possible to collect during the few summer months was restricted.

When the benefits of increased manuring and of increasing the arable land up to the limit permitted by the supply of manure were exploited, any further increase in food production would demand a restructuring of the system of stone walls. New, land-use categories would have to be introduced—the cultivation on the utmark or the introduction of a field layout adapted to regular fallowing. These restructurings could not be achieved within the existing, spatial structure of the stone-wall complexes. If we assume that an endeavour to increase production was inherent in the system, the eventual restructuring of the agrarian landscape was therefore an expected event.

To sum up, the early-Iron-Age period of expansion can thus be seen as having been caused by the introduction of a new farming system. But, although this farming system permitted a marked increase in food production at the beginning, it also set some very definite limits to further increase above a certain point. The contradiction between the endeavour to increase production and the inertia of the existing spatial and social structure may be seen as one of the contributory factors behind the period of decline and restructuring in the middle of the first millennium A.D.

However, as far as we can judge, the crisis did not lead to the establishment of a radically new farming system at the beginning of the late Iron Age. The expected effects of the restructuring on agrarian production cannot be documented until the 10th and 11th centuries, when the two-field system was introduced and cereal cultivation expanded in the area. Instead, the most evident result of the crisis was the establishment of new, basic territories.

This restructuring of the territorial division probably indicates that major social changes were taking place. The meaning of these changes has not been investigated in this thesis, but the division into the historical by territories laid the foundation for the subsequent taxation of land and for the development of private ownership. Thus, the developments during the 7th and 8th centuries A.D. cannot be explained only on the basis of changes in farming. In this short-term perspective, changes in population and in social structure rather than changes in agrarian technology and the farming system may have played the decisive role.
**LEGEND**

**Maps measured in the field**

- Stone wall
- Location of trench
- Bare bedrock in connection with stone walls
- Terrace, positive lynchet
- Negative lynchet
- Clearance heap
- Sunken track
- Grave
- Cemetery
  - the number refers to the register kept by the Central Office of National Antiquities
  - Mound of split stones
  - Water-hole, lake
  - Limit of recent cultivation
  - Gravel pit
  - Recent stone-wall
  - Building
  - Recent track or road
  - Contours, above sea-level
  - """, related to a local fix

**Re-drawings of early maps**

- Arable land
- Fence
- Settlement
  - Boundary of single farm or by
  - Boundary of parish

**Sections and plans**

- Bedrock
- Clay
- Till
- Dark layer
- Layer with soot and charcoal
- Charcoal
- Packing of stones
- Radiocarbon sample
  - """, collected

- Stensträng
- Plats för schakt
- Berg i dagen i anslutning till stensträng
- Terrass, åkerren
- Åkernisch, åkerbak
- Odlingsrös
- Hälväg
- Gravanläggning
- Gravfält
  - "", formlämningsnummer i Riksantikvarieämbetets register
  - Skärstenshög
  - Vattenhål, sjö
  - Gräns för sentida odlingsområde
  - Grustäkt
  - Sentida stenmur
  - Byggnad
  - featured väg
  - Höjdfältet, m.o.h.
  - "", över/under lokal fixpunkt

- Åkermark
- Gårdsgränd, högnad
- Bebyggelse
- Gräns för hemman eller by
- Sockengräns

- Häll
- Lera
- Morän
- Mörkfärgat lager
- Kolrikt, sotigt lager
- Träkol
- Stenpackning
  - C 14-prov
  - "", från lager
Table 7. Radiocarbon analyses from settlements and stone walls in the Fläret area

<table>
<thead>
<tr>
<th>Dating no.</th>
<th>Site</th>
<th>Trench and no.</th>
<th>Material</th>
<th>C\textsuperscript{14}-years B.P. (T = 5568)</th>
<th>Corrected age B.P. according to ( \delta^{13}C ) values</th>
<th>Calibrated age in calendar years</th>
</tr>
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<tr>
<td>St 5499</td>
<td>Lövsveden II LD I</td>
<td>Charcoal</td>
<td>610±205</td>
<td>90 B.C.</td>
<td>A.D. 1315</td>
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</tr>
<tr>
<td>St 5500</td>
<td>&quot;</td>
<td>LD II</td>
<td>350±125</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 5501</td>
<td>&quot;</td>
<td>LC I</td>
<td>2015±130</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
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</tr>
<tr>
<td>St 5506</td>
<td>&quot;</td>
<td>LA I</td>
<td>560±80</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
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<td>Charcoal</td>
<td>1985±90</td>
<td>55 B.C.</td>
<td>A.D. 1365</td>
<td></td>
</tr>
<tr>
<td>St 5754</td>
<td>Jorstorp JA I</td>
<td>&quot;</td>
<td>1810±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 5776</td>
<td>Nygård IV NA I</td>
<td>&quot;</td>
<td>2075±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 5777</td>
<td>Nygård III NC I</td>
<td>&quot;</td>
<td>1770±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 5778</td>
<td>Fläret III FA I</td>
<td>&quot;</td>
<td>1855±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6475</td>
<td>Fläret I FC I</td>
<td>&quot;</td>
<td>1805±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6476</td>
<td>&quot;</td>
<td>FC II</td>
<td>1950±110</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6477</td>
<td>&quot;</td>
<td>FC III</td>
<td>1815±110</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6478</td>
<td>&quot;</td>
<td>FD I</td>
<td>950±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6479</td>
<td>&quot;</td>
<td>FD II</td>
<td>630±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6480</td>
<td>&quot;</td>
<td>FE I</td>
<td>2345±100</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6481</td>
<td>&quot;</td>
<td>FE II</td>
<td>2265±95</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6482</td>
<td>Nygård III NG I</td>
<td>&quot;</td>
<td>1755±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6483</td>
<td>&quot;</td>
<td>NG II</td>
<td>1935±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6607</td>
<td>Fläret III FA II</td>
<td>&quot;</td>
<td>1970±145</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6608</td>
<td>Jorstorp JA II</td>
<td>&quot;</td>
<td>1400±95</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
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<tr>
<td>St 6609</td>
<td>&quot;</td>
<td>JA III</td>
<td>1795±95</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6961</td>
<td>Fläret I FG I</td>
<td>&quot;</td>
<td>1915±95</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
<tr>
<td>St 6962</td>
<td>Färet II FL I</td>
<td>&quot;</td>
<td>1780±90</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
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</tr>
<tr>
<td>St 6963</td>
<td>&quot;</td>
<td>FJ III</td>
<td>&lt;250</td>
<td>55 B.C.</td>
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<tr>
<td>St 6964</td>
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<td>FJ IV</td>
<td>1680±95</td>
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</tr>
<tr>
<td>St 6965</td>
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<td>FK I</td>
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<td>90 B.C.</td>
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<tr>
<td>St 6966</td>
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<td>FJ I</td>
<td>490±170</td>
<td>55 B.C.</td>
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<tr>
<td>St 6967</td>
<td>&quot;</td>
<td>FJ II</td>
<td>400±110</td>
<td>55 B.C.</td>
<td>90 B.C.</td>
<td></td>
</tr>
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</table>

Radiocarbon analyses of lake and mire sediments are shown in Tables 2 and 3. The values are calibrated according to Damon et. al. 1974
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Abbreviations

AmS Arkeologisk museum i Stavanger
ATA Antikvariskt-Topografiska arkivet, Stockholm (Antiquarian-Topographical Archives, Stockholm)
DGU Danmarks geologiske undersøgelse (Geological Survey of Denmark)
GA Geografiska Annaler
GFF Geologiska Föreningens Förhandlingar
KVHAA Kungl. Vitterhets Historie och Antikvityets Akademien (Royal Swedish Academy of Letters, History and Antiquities)
LMV Statens Lantmäteriverk, Gävle (National Land Survey of Sweden, Gävle)
NAR Norwegian Archaeological Review
Raä Riksantikvarieämbetet, Stockholm (Central Office of National Antiquities, Stockholm)
SGU Sveriges Geologiska Undersökning (Geological Survey of Sweden)
SMÅ Stavanger Museum Årbok

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