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Evaluation of human impact on vegetation and the determination of areas cleared from forests in Southern Scandinavia during Late Mesolithic and Neolithic times

Kristina Jennbert

Summary

The questions dealt with in the course of this workshop are rather complex. In order to outline the state of the art in Southern Scandinavia the character of the archaeological and palaeobotanical source material and different theories on early agriculture were summarized. Theoretical and methodological problems which are implied in ecological and archaeological interpretations of the past were discussed in order to get an idea of the extent of deforestation during Late Mesolithic and Neolithic times. A humanistic view on the human beings living thousands of years ago has been stressed. A sound knowledge of these people's way of life is the most important prerequisite for all research activities related to the past.

Zusammenfassung

Die im Verlauf dieses Symposiums aufgeworfenen Fragen sind sehr komplexer Natur. Um den derzeitigen Forschungsstand im südlichen Skandinavien aufzuzeigen, wird ein Überblick über die Beschaffenheit des archäologischen bzw. paläobotanischen Ausgangsmaterials gegeben. Gleichzeitig werden verschiedene Theorien über den früheren Ackerbau skizziert. Durch die Erörterung theoretischer und methodologischer Probleme, die implizit in den ökologischen und archäologischen Interpretationen der Vergangenheit enthalten sind, soll versucht werden, eine kritische Bewertung der spätmesolithischen und neolithischen Entwaldung vorzunehmen. Insgesamt steht eine umfassende Betrachtung der Menschen, die vor vielen Jahrtausenden gelebt haben, im Vordergrund dieses Artikels. Eine fundierte Kenntnis der Lebensweise dieser Menschen ist eine unabdingbare Voraussetzung für alle Forschungsaktivitäten, die sich mit der Vergangenheit beschäftigen.

1. Scandinavia

Scandinavia is the northernmost part of Europe. Compared to other regions in Europe, Scandinavia may be termed a marginal area with regard to cultivation since the introduction and establishment of agriculture occurred nearly 1000 years delayed.

As Scandinavia is a large geographical area, agriculture was introduced there at different times and can be associated to different cultures. Consequently, the neolithisation processes in the Nordic area occupied a very long time, progressing from the initial introduction of agriculture to more or less permanent farming. The first elements of an agrarian economy can roughly be located within the different phases of the Stone Age and the Early Bronze Age (JENNBERT, 1987).

A model of the introduction of farming was created 15 years ago. Farming was introduced to Southwest Scandinavia around 3300 B.C. This phase of establishment is assigned to the Ertebølle Culture and to Funnelbeaker A pottery. The younger expansion is associated with Funnelbeaker C pottery around 2800 B.C. and reached South Norway and Middle Sweden. One further Neolithic expansion is connected with the Battle Axe Culture around 2300 B.C. By that time farming extended further north including the coast of North Sweden and Southwest Finland (SPÅNG *et al.*, 1976).

The picture given at that time (15 years ago) still illustrates the development towards agricultural production. Today it can be revised to a certain amount and especially so the interpretation of the regression of farming during the Middle Neolithic.

The Nordic source material is characterized by the frequent combination of archaeological sources and palaeoecological analyses. This co-operation has a long-standing tradition and occurred already in the first Danish Kitchen Midden Commissions in the mid-nineteenth century.

In recent years both archaeological and palaeoecological studies have considerably broadened our knowledge of the introduction of agriculture and the character of the first arable farming.

In order to discuss the degree of human impact and the extent of open spaces it is necessary to give some background information on the records and theories of Late Mesolithic and Neolithic times. Since these periods cover around 2000 years and the area of investigation is very large, I have selected certain periods and areas as representative examples of the current state of affairs in Southern Scandinavia.

2. The neolithisation in Southern Scandinavia

Investigations on the transition from Mesolithic to Neolithic times in Southern Scandinavia have a long research tradition. My own studies have focussed on this transition phase (JENNBERT, 1984). The growing interest in neolithisation processes is reflected in many articles and a symposium on the introduction of agriculture into the Nordic area was held in Oslo in 1980 (SJØVOLD, 1982). Among the topics of paramount importance were subjects like "the transition to farming in Northern Europe" (ZVELEBIL & ROWLEY-CONWY, 1984)

and "neolithisation processes in the south of Scandinavia" (ROWLEY-CONWY, 1985; JENNBERT, 1985).

In Southern Scandinavia the Late Ertebølle Culture is known as the last hunting-and-gathering culture. The Early Funnelbeaker Culture is tied to a settlement structure of agrarian character. The Ertebølle Culture and the Funnelbeaker Culture belong to those Stone Age traditions that have been subject to intense research endeavours since the mid-nineteenth century. The delimitation between these two cultures has been controversial ever since and this has affected the interpretation of the neolithisation process in South Scandinavia. The resulting theories have been characterized by a multi-disciplinary approach and by the application of ecological models.

2.1 The archaeological record

The Ertebølle Culture is known best by the kitchen-middens in Denmark. Above all, there are settlement sites with artifacts of flint, stone or wood, pottery, and bone remains among other things depending on the soil conditions.

My own investigations have focussed on the extreme south of Sweden and concentrated on evidence from settlement sites and individual finds. Above all, the settlement sites have been analysed in order to get a starting point for discussions on the conditions that were instrumental to neolithisation. Settlements of the Ertebølle and Funnelbeaker Culture give an impression of the utilization of the landscape. The emphasis has been placed on so-called "mixed" sites - sites with simultaneously occurring Ertebølle and Early Neolithic finds, which in my opinion are typical for a transition phase. Such sites may reveal new perspectives for elucidating the introduction of farming and are very important in view of theoretical and methodological approaches.

2.3 The palaeoecological record

The transition phase from Atlantic to Early Subboreal times has been appointed to 5000 yr B.P. Many pollen diagrams suggest that man had interfered with the climax forest before the elm decline. In addition, several investigations imply that crops had been cultivated during Late Atlantic times (KOLSTRUP, 1987; GÖRANSSON, 1982) and thus before the elm decline, and that the forests at that time might have been transformed into coppice woods (GÖRANSSON, 1982).

Imprints of grain have been found in both Ertebølle and Early Neolithic pottery at the settlements of Lödöborg and Vik in southernmost Sweden. The sites were radiocarbon dated to Late Atlantic times and thus preceded the elm decline (JENNBERT, 1984: 94).

There is a lively debate on the palaeobotanical methods used for environmental reconstructions (BERGLUND, 1985). In addition to the pollen analytical method BERGLUND mentions several other palaeobiological methods, for instance charcoal, osteological, and plant macrofossil analysis. BERGLUND emphasizes the need for interdisciplinary projects and gives many examples of palaeoecological interpretation problems related to the early agricultural landscape.

2.4 Theories

As in other historical disciplines, research on neolithisation has undergone fundamental change during the recent decades. Current research on Scandinavian neolithisation processes reveals an interest in problems of change, theoretical frames, and a variety of source material. Although the riddle of the introduction of agriculture might persist forever, Scandinavian research provides a number of ideas and theories on this classical topic of archaeological investigation.

Two alternative ways of interpreting the neolithisation process are classical in Southern Scandinavian research. According to the first theory the Ertebølle Culture, preoccupied with fishing and hunting, and the Early Neolithic agrarian culture have to be considered as two distinct cultural and economic phenomena, because agriculture was brought to Southern Scandinavia by immigrant groups (BECKER, 1955). The second hypothesis implies that the preconditions for an agrarian economy existed within the local Late Ertebølle Culture (TROELS-SMITH, 1953). Investigations during the past 20 years have favoured either the first or the second interpretation and supported both of them with new arguments.

The delay of several hundreds of years in the introduction of agriculture to Scandinavia has been attributed to the existence of favourable natural conditions within the local Ertebølle Culture (a.o. ROWLEY-CONWY, 1983, 1984). For a long time, foraging remained a good alternative to agriculture. There was no need for farming activities before the decline of oysters due to a change in sea-level and an increasing pressure of population (ROWLEY-CONWY, 1983, 1984).

My own ideas are in contrast to this opinion (JENNBERT, 1984, 1988). The products of farming and animal husbandry are regarded as luxury goods which were by no means essential for the survival of man. The people concerned are assumed to have lived in a favourable ecological setting and therefore not compelled to get familiar with a new method of production. Grain and cattle are supposed to have been introduced in the course of gifts being exchanged, tributes being paid, and matrimonial alliances being formed, involving neighbouring groups and the "fully Neolithic" groups further to the south. As a metaphor, "the fertile gift" symbolizes the introduction of agrarian production which is, in its turn, associated with internal and external relationships.

But what about nature? The Løddesborg site (the first settlement analysed) is assigned to a regression phase. So far, however, there is no reason to assume that a regression during the Late Atlantic had effects on the marine resources, at least not in such an open coastal setting as the position of Løddesborg site represents. Nor do climatological investigations (TROELS-SMITH, 1960; BERGLUND, 1983) furnish any evidence that climate might have changed, thus affecting the ecological environment and the available resources man could subsist on.

The last two theories imply different conclusions about the problem of why and how farming was introduced. They open up several feasible ways of interpreting the varying palaeo-ecological circumstances and climatological reasons for changing the modes of production.

Another point of view has evolved from settlement studies of the Neolithic in Denmark. MADSEN states that a Mesolithic occupation in big camps and ecologically productive areas was followed by a Neolithic occupation phase characterized by small and mobile sites clustered along elongated barrows. He calls the transition from the Mesolithic to the Neolithic a true "black-box" problem (MADSEN, 1987). His view seems to be rather pessimistic and hopeless.

3. The Neolithic expansions

In the following I intend to give a very brief description of the Neolithic archaeological periods. This seems to be of some importance because (a) the archaeological situation in Southern Scandinavia shows a considerable degree of regional differentiation and (b) the relation between Neolithic man and his environment has not been studied too intensively from the archaeological side. Other problems have been investigated instead.

The lively discussion on palaeoecological methods and ways of interpreting pollen diagrams has led to different ways of reconstructing the natural environment and its exploitation level. Research on this topic is of vital importance for progress in archaeological theories.

However, the archaeological source material of the Neolithic period in Southern Scandinavia shows a great variety. Both in qualitative and quantitative respects we have abundant archaeological source material, consisting of settlement sites with longhouses, monumental graves, flint mines, sacrificial places etc. Compared to earlier periods, the Neolithic landscape was characterized by a higher degree of cultivation and the population must have been considerably larger than before.

In order to get a starting-point for the evaluation of human impact I have chosen two research areas where the human impact on vegetation had been essential. The Ystad project is situated in the extreme south of Sweden, and the Alvastra pile dwelling in Middle Sweden.

Both research projects represent good examples of interdisciplinary cooperation between archaeologists and palaeobotanists.

3.1 The Ystad project

The project on "The cultural landscape during 6000 years" in a selected area in southernmost Sweden was carried out from 1982-1988 under the direction of B. BERGLUND. This interdisciplinary project was performed in close cooperation between six disciplines, belonging to both the humanities and the natural sciences, at the University of Lund (BERGLUND, 1988).

The project aimed at analysing the development of the agrarian landscape in a long-term perspective, including phases of expansion (increased clearance, grazing, coppicing, agriculture etc.) which were often followed by stagnation/regression periods. The background factors were found in the social as well as the environmental situation and were thus partly due to nature and partly to man (BERGLUND, 1988: 242).

The field area could be divided into three landscape units stretching from the coast towards the interior; a coastal landscape, an outer hummock landscape, and an inner hummock landscape. This zonation implied a gradation from central to marginal settlement areas which seems to have been effective also in prehistorical and historical times (BERGLUND, 1988: 247).

In the archaeological section of the project different settlement patterns were discussed. During the Late Mesolithic and the Neolithic settlements changed in location and were dispersed within the landscape zones. Due to changes in the ecosystem and the social sphere, the number of settlements increased during the Neolithic (LARSSON, 1990; LARSSON, 1988, 1989).

In Late Mesolithic, Early and Middle Neolithic times the forests were more or less undisturbed except for a number of small cultivated fields. More extended clearing activities did not occur before the Late Neolithic and especially the Younger Bronze Age (Berglund, pers. comm.).

3.2 The Alvastra pile dwelling

Discovered in 1908, the Alvastra pile dwelling was excavated under the direction of O. FRÖDIN during 1909-1930. MALMER continued excavations during 1956 and 1976-1980 (MALMER, 1978). The site provided artefacts represented both in the Early Middle Neolithic Funnelbeaker Culture and the Pit-Comb Ware Culture and was dated to around 2500 B.C. (BROWALL, 1986). According to MALMER the site served as a social and cult

centre, a meeting place for rich feasting and for sacrifices to superior powers (MALMER, 1983). In a spatial analysis BROWALL found out that the society was regularly grouped and consisted of 17 households (BROWALL, 1986).

The Alvastra excavations were carried out in the frame of an interdisciplinary project with members of several disciplines. Above all GÖRANSSON's pollen analytical work is of great importance. His conclusions are expressed by a multi-dimensional model. The reasons for the elm decline are derived from a set of interacting physical and biological factors. Consequently, the following regeneration may be interpreted as being caused by further changes in these interacting factors. It is suggested that the pollen spectra of the regeneration phase indicate the presence of coppice woods, but also of true forest succession. Shifting cultivation was practised on light soils in coppice woods. The very large, open mires in the area of investigation constituted important grazing areas during the whole of the Neolithic (GÖRANSSON, 1988).

Dendrochronological analyses yield a further source of information on forests. The Alvastra pile dwelling shows that none of the logs taken from the surrounding woodland came from primeval or natural forests. All the trees used for building the pile dwelling had grown out of stumps (BARTHOLIN, 1987) and thus GÖRANSSON's picture of coppice woods is confirmed.

The Alvastra site is important in many ways and GÖRANSSON's investigations face the archaeologists with many problems since the conventional picture of Neolithic agriculture is turned upside down. Consequently, the way of life and the relation between the different archaeological cultures in Middle Neolithic times must be examined - a classical topic in Scandinavian research endeavours.

4. Quantifying prehistory

The evaluation of human impact on vegetation may be considered a qualitative research process, based on archaeological and palaeoecological information.

Do we really have possibilities to quantify prehistory in terms of areas cleared from forests? Maybe it is a better way to estimate different types of vegetation and look for differing percentages of open spaces, as has been done in the Ystad project (BERGLUND, in press).

I feel anxious about talking in terms of percentages of deforested areas, because so far the archaeological and palaeobotanical records have been too vague. Besides, from an archaeologists point of view the discipline is not able to provide an objective picture of the past, since too many factors and perceptions have to be taken into consideration.

5. Evaluation of human impact on vegetation

Provided by different scientific disciplines and based on different types of evidence there are a lot of analyses giving information on human impact. I would like to add some theoretical and methodological remarks. I will then list some possible sources for the evolution of human impact, together with ideas of how to extract the information.

When trying to understand the process of neolithisation it is of utmost importance to decide whether the earliest agriculture has to be regarded as an essential factor of human survival. Research on neolithisation has been strongly affected by abstractions denoting the economic activities. Opinions on this point have been influenced by palaeobotanical studies and also by the individual scholar's view on people and societies. The theoretical framework and the ideas about how and why people changed their way of life are, however, of vital importance.

Another essential factor consists in the perception of human beings. The perception of man is crucial for the understanding of society and its investigation. Is man a biological creature closely tied to instincts or a socialized human being responding to constellations in his social surroundings (WELINDER, 1985: 95; TILLEY, 1981: 365)? Investigations of human behaviour have to include the dimension of time. Although important, the concept of time has often been neglected in the discussions about cultural change. Was the transition to farming a slow and gradual process or a rapid one?

According to my opinion the first agricultural activities did not have strong effects on vegetation, as I interpret farming as a more or less exclusive phenomenon in Early Neolithic society. However, during Middle or Late Neolithic times farming might have interfered with landscape more intensively. Concerning human impact on vegetation several types of source material have to be taken into account. Besides, there is a need for archaeological context information (MADSEN, 1985: 93). Imprints of grain and weed in pottery (JENNBERT, 1984: 94; HJELMQUIST, 1979; KRISTIANSEN, 1988: 49) and plant macrofossils from culture layers help to improve the understanding of the early rotation system, agricultural techniques, manure practices, local vegetation etc. (BERGLUND, 1985; WASYLIKOWA, 1981). Highly developed laboratory techniques make it possible to identify even traces of food or other substances in food-encrusted pottery fragments. The Ertebølle pottery found at Lød-desborg was characterized by traces of seeds, hazelnut kernels, albumin, and possibly blood. There were no traces of alanin, an amino acid found in corn (ARRHENIUS, 1984).

Osteological analyses of bone remains give information on animal production, forest composition, grazing activities etc. The form of nutrition represents one further potential source of palaeoenvironmental changes. In order to gain information on diet, the bony tissue of individuals from the Alvastra pile dwelling was analysed (measurement of ^{13}C -content and strontium/calcium ratio; cp. SÆLEBAKKE & WELINDER, 1988).

On the whole, there are several methods which are able to supply information on nutrition, environmental conditions (including the degree of exploitation) and the extent of deforestation.

6. Areas cleared from forests in Southern Scandinavia

The possibilities of determining the percentage of open spaces during Late Mesolithic and Neolithic times do not seem to be very promising.

There is a general agreement that early agriculture made use of slash-and-burn practices with the earliest traces dating from Subboreal times (IVERSEN, 1941; STEENSBERG, 1982; TROELS-SMITH, 1982; MADSEN, 1982; HULTHÉN & WELINDER, 1981; LARSSON, 1984). However, a different opinion is based on an alternative way of interpreting the relevant pollen diagrams. According to this opinion, coppice woods may already have existed in Late Atlantic times (GÖRANSSON, 1982, 1988) and developed due to girdling practises. On account of the improved light access these coppice forests were highly suitable for forest cultivation.

The different conclusions implied in these approaches do not facilitate the task of determining forest recession. With regard to the slash-and-burn practises the first theory presumes a higher percentage of cleared areas. In contrast, the second theory implies utilized coppice forests, different types of vegetation, and a low percentage of open spaces.

No matter which agricultural method is chosen it will inevitably affect the evaluation of deforestation. A further aspect is that of grazing. How, for instance, does the composition of bone remains correspond to the botanical analyses?

For the evaluation of the areas cleared from forests in Neolithic times it might prove useful to consider the percentage of open land in historical times. In the favourable agricultural districts of Middle Sweden only 10-15 % of the landscape consisted of cultivated fields around 1650 A.D. (HANNERBERG, 1971: 22). In combination with the results obtained from the Ystad project this leads to the conclusion that only few per cent of the forest cover were cleared in Late Mesolithic and Early Neolithic times. At the end of the Early Neolithic period and during the Middle Neolithic the percentage of open spaces increased but slightly.

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**Evaluation of land surfaces cleared
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in Early Neolithic times and the time
of migrating Germanic tribes**

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