Historical agricultural landscapes within the forest zone of the East European Plain

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Abstract: Intensive agricultural development of the contemporary forest zone of the East European Plain started in the second part of the first millennium AD and this was the most agriculturally developed area of the EEP up to the end of the 18th century in spite of its severe nature environment. The analysis of interrelationships between environmental conditions and the agricultural pattern across time and space is a base for study of agricultural landscapes in Northern Europe.

Key words: agricultural landscape, East European Plain, forest zone

Introduction

The forest zone occupies a large area within the East European Plain (EEP). Intensive agricultural development of the forest zone of the East European Plain (EEP) started in the second part of the first millennium AD caused mainly by the nomadic invasion so-called “The great migration of peoples”, which took place in the middle of the first millennium AD. As a result the grain-growing tribes left their lands and some of them, namely Slavs in the center and west of the EEP and Finno-Ugric tribes in the east, migrated to the north under the protection of impenetrable forests. Although settled Finno-Ugric and Slavic tribes suffered greatly from nomad incursions, only in the 8th-9th centuries did climatic warming allow them to reach their northern limits, which have been preserved as the boundary of agricultural development in some areas up to today (table 1). In fact the forest zone was already populated at the time of the migrations. Different Finno-Ugric tribes lived in the central and eastern parts of the forest zone, while Balts occupied the western part of the plain, on the southeastern coast of the Baltic Sea. They pursued non-plough agriculture, but hunting and fishing prevailed. Thus intensive development of plough agriculture within the contemporary forest zone of EEP since the second part of the first millennium AD, resulted in turning it to the most agriculturally developed area of Russia until the end of the 18th century.

Table 1. Summer average temperature oscillations (Shpolyanskaya, 2003)

<table>
<thead>
<tr>
<th>Years</th>
<th>600 B.C.</th>
<th>200 A.D.</th>
<th>500 A.D.</th>
<th>1000 A.D.</th>
<th>1250 A.D.</th>
<th>1500 A.D.</th>
<th>1700 A.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆X °C</td>
<td>-2</td>
<td>2</td>
<td>-2.5</td>
<td>1</td>
<td>-1</td>
<td>-0.2</td>
<td>-2</td>
</tr>
</tbody>
</table>

Objectives and methodology

The goal of our research is to explain peculiarities of Russian northern agriculture development studying areas of old agricultural landscapes, their pattern across space and corresponding rural settlement patterns, based on the interrelationships of the natural environment, social situations, and agrarian technologies, using the forest zone of EEP as an example. In order to accomplish this task we examine the following questions:
1. What are the historical agricultural landscapes and when did they appear?
2. What are the relationships between the historical types of agricultural landscapes and the environment, including nature, society, and agrarian technologies?
3. What is the relationship between the historical types of agricultural landscapes and the parameters of corresponding rural settlements, including location and size?

The main approach used in this research is a comparative historical geographical analysis. An historical GIS was designed for the forest zone of the EEP, which united the available historical cartographic data with geological, climatic, and other geographical maps including remote sensing data and modern topography. Analyses of remote sensing data and land use maps, along with field trips, were aimed at finding specific types of agricultural landscapes. Historical geographical analysis detected their age and peculiarities of development.

This research is based on a complex of heterogeneous data concerning different historical periods. The research combines three levels of generalization. The first one deals with the whole forest zone of the EEP and general laws of agricultural development within it. On the second level historical types of agricultural development are revealed and analyzed by their location, age, and general spatial and settlement patterns. The third, most detailed, level is used to study the internal structure of certain agricultural landscapes and relationships between their spatial and settlement patterns.

**Foundation for agricultural landscape analysis**

Many researchers, starting with Odum (1994) have examined the differences between natural landscapes and agricultural ones. The main difference between agricultural and natural landscapes results from the fact that agricultural landscapes are not self-governing systems like natural landscapes, but governed subsystems of a more complicated self-governing general social system. Therefore we cannot regard agricultural ecosystems as simple modifications of natural units. An agricultural landscape is a main material part of a traditional cultural landscape. Agricultural landscapes are always linked with settlements. The settlements are the centers of corresponding agricultural landscape units. They are the kernel of the inner pattern of any agricultural landscape, while this pattern is determined in particular by the natural environment and agricultural techniques.

For example, hoe-mattock agriculture used by the Anan’inskii tribes in the Iron Age determined their settlement pattern so that the settlements were located on high river banks with wide flood terraces beneath (Arkheologiya 1997), which were the only suitable area for this type of agriculture. They were more or less woodless and always fertile because of repeated flooding. Subsequent peoples used slash-and-burn agriculture. This type of agriculture does not depend upon the distribution of woodless flood plains. Restoration of soil fertility is provided by giving up any plot after several years of use and returning to it after many years when the natural fertility would be restored. These peoples are also characterized by a special settlement pattern and specific type of agricultural landscape. Their settlements were large not only for defensive purposes but also because slash-and-burn agriculture required intense efforts by large numbers of people over short periods of time. At the same time the absence of the plough put limitations upon which sites were suitable for cultivation. Only sandy and sandy-loam soil could be used. This soil can be found in Q fluvioglacial valleys, most of which were inherited by modern rivers.

The next stage of agricultural development, namely plough agriculture, once again changed the agricultural landscape and the corresponding settlement pattern. Permanent arable land with more or less regular crop rotation appeared. As a result the area of arable land necessary for one person decreased, while the anthropogenic impact changed and increased. Using draught houses and ploughs allowed people to give up on tilling sandy soil, which is very poor. Obligatory conditions for persistent tillage in the forest zone include more or less regular crop rotation and fertilizing (manuring) of the soil. This change in agricultural technique resulted in a change in the settlement pattern. Minimising distance to the settlement appeared to be a very important factor for decreasing labour expenditure. Small settlements for 1 to 3 farms appeared starting at the end of the first millennium AD, instead of large villages of the Iron Age. Archaeologists (Sedov 2005, Bader 1951) recorded the dispersal of large patriarchal families (clans) into a great number of small settlements (of 1 to 3 houses) at the beginning of the second millennium AD.
Historical agricultural landscapes of the forest zone of the EEP

The whole forest zone of Europe was characterized by an amazing uniformity of agriculture and monotony of economic systems during the Medieval epoch. According to Slicher van Bath (1963) the average production of the main cereals was at a ration of about 1 measure of seeds planted to 4.3 measures of grain yielded in France at the end of the 15th century, while in Germany, the Scandinavian countries, Poland, Latvia, Lithuania and Estonia they were 1 to 4.1 and 1 to 4.2 even in the 16th century. The same was true in the forest zone of Russia. As is stressed in the Agrarian History of Northwestern Russia (Agrarnaya 1978, p. 372), the state of agriculture in northwestern and northeastern Russia in the 15th century did not differ essentially from other countries situated in the non-chernozem zone of Eastern and Central Europe: the same prevalence of the three-field system, a similar set of crops, similar agricultural tools, and, at least, the same instability and discontinuity of yields and their similar values.

At first sight such uniformity of agriculture within a large area of northern Europe clashes with the diversity of the natural conditions, including climate (table 2). Differences can however be found in the peculiarities of selective spatial agricultural land use that resulted in different historical types of agricultural landscapes in different regions, which stand in close relationship with settlement spatial patterns. Hence, determining and analyzing agricultural spatial landscape patterns is the first step in detecting extinct rural settlements of the forest zone of the EEP.

Table 2. Contemporary climate parameters in the Forest Zone of the East European Plain

<table>
<thead>
<tr>
<th>Zone</th>
<th>Settlements</th>
<th>Average Temperature, 0C</th>
<th>The sum of effective temperatures (&gt; 1000C)</th>
<th>Precipitation per year, mm</th>
<th>Frost-free period, days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
<td>Average Temperature, 0C</td>
<td>Per year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone</td>
<td>Settlements</td>
<td>January</td>
<td>July</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern warm zone (opole)</td>
<td>Ryazan’</td>
<td>-8,0</td>
<td>19,0</td>
<td>4,2</td>
<td>2200</td>
</tr>
<tr>
<td>Western temperate zone of young landscapes</td>
<td>Novgorod</td>
<td>-8,0</td>
<td>18,0</td>
<td>4,0</td>
<td>1950</td>
</tr>
<tr>
<td>Central temperate zone of older landscapes</td>
<td>Valday</td>
<td>-10,5</td>
<td>16,0</td>
<td>2,5</td>
<td>1550</td>
</tr>
<tr>
<td>Northeastern cold zone of older landscapes (Perm district)</td>
<td>Moscow</td>
<td>-10,0</td>
<td>18,0</td>
<td>3,0</td>
<td>2000</td>
</tr>
<tr>
<td>Kudymkar –Invenskoe porech’e</td>
<td>-15,7</td>
<td>17,4</td>
<td>1</td>
<td>1737</td>
<td>450-470</td>
</tr>
<tr>
<td>Vereschagino Obviskoe porech’e</td>
<td>-15,5</td>
<td>17,8</td>
<td>1,3</td>
<td>1819</td>
<td>440-460</td>
</tr>
<tr>
<td>Northwestern cold zone of young landscapes</td>
<td>Kargopol</td>
<td>-14,0</td>
<td>16,0</td>
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</table>

The named settlements are mostly old towns, which appear to have been centers of agricultural development since their origin. Their locations are shown in figure 1.

It is common to perceive the natural environment as stable, compared to dynamically changing anthropogenic factors. However, landscapes do change through time, and in the EEP landscape age is a strong determinant of potential production capacity. The majority of the forest zone landscapes are very young; they appeared in the Quaternary once the area became ice-free after the glacial period. The age of landscapes increases from the northwest (the youngest and most diverse) to the southeast, where the forest zone comes out of the formerly-
glaciated area. So, different sectors of the forest zone are characterized by different geological conditions, which greatly influence their agricultural potential. The east and southeast of the region belong to the periglacial area, which was never covered with glaciers during the Pleistocene. The middle of the region is covered with deposits of the middle Pleistocene Moscow glacier, which corresponds to the Riss Ice Age in Alpine terminology, while the drift deposits in the western sector of the region formed under the last upper Pleistocene Valday glacier, corresponding to the Würm. The area of the Valday glacier is characterized by the most contrasting mosaic of geological and geomorphologic conditions, with young, slightly developed and usually boggy river valleys unsuitable for cultivation.

At the same time climate harshness increases from the southwest to the northeast of the forest zone (Table 2). The analysis shows that the climatic conditions are favorable for plant agriculture only in the southern part of the forest zone, while the northern and eastern parts are much less favorable and their usefulness for agriculture is usually due to local microclimates, which depend on geological and geomorphologic peculiarities. In fact it is not one single factor but a result of specific combinations of geological, topographical and other factors, which controls the distribution of arable land and hence of rural settlements.

Thus we can describe the change in environmental conditions in terms of two main natural trends: the climatic trend of increasing harshness from the southwest to the northeast and the geological trend of increasing landscape age from the northwest to the southeast. These trends form five zones (fig. 1). The main idea behind this zonation is that every zone is characterized by a certain set of historical types of agricultural landscapes, which are discussed in this paper. The boundaries of these zones are rather conventional and include transition belts. One can find two cold and two temperate zones (of correspondingly younger and older natural landscapes), and the southern warm zone. The boundary between the cold and temperate agricultural zones is tentatively taken as the boundary between the cold and temperate climatic zones, according to the ratio of the sums for active (>10°C) and negative (<0°C) temperatures: \( \frac{1}{2} \sum_{a} > 10°C \cdot \frac{1}{2} \sum_{n} < 0°C \) per year as suggested by V. Uglov (1987). The cold climatic zone is characterized by a ratio of less than 1, while the temperate climatic zone is characterized by a ratio of more than 1. The boundary between older and younger natural landscapes is taken as the boundary of the latest Valday (Würm) glacial deposits.

![Fig. 1. EEP zones of agricultural development under climatic and geological trends](image-url)
The Southern warm zone

The analysis shows that the southern part of the forest zone, where the climatic conditions are favorable for agriculture and do not limit it, nevertheless looks like a mosaic of regions, with tillage percentages varying from 15% to 80%. This mosaic mainly corresponds to areas locally known as opol'e and poles'e, shown in figure 1. In Russian, “opol'e” comes from a word meaning field; “poles'e” comes from a word meaning wood. Opol'e areas are regions with high tillage (50-80%), while low tillage is characteristic of poles'e areas.

The terms opol'e and poles'e correspond to two types of landscape, which in the aggregate form an opol'e-poles'e structural morphological landscape belt (Milkov 1964). This belt stretches from west to east through the central part of the EEP in the periglacial zone of the Moscow (Riss) glaciation, taking in the whole southern part of the forest zone.

Poles'e areas tend to have elongate shapes because they follow landforms formed by glacial melt-water streams, and consist of well-washed fluvioglacial sand, which produces very poor soil. On the other hand, the opol'e areas were high topographic “islands” among fluvioglacial streams where loess-like sediment developed during the last glaciation. Their current form is a result of centuries of intensive agricultural development. Their high topographic level provides for good drainage and the most fertile soil within the forest zone develops on loess-like sediment. It should be stressed that the fertile soil of the opol'e is a result of their long periglacial development, contrary to the younger Valday landscapes.

Northeastern cold zone of older landscapes

Northeast of the opol'e-poles'e belt climate harshness rapidly increases (fig. 1, table 2) and its influence dominates in the distribution of arable land and rural settlements. The influence of the temperature regime is both direct, on prevailing crops and agricultural patterns, and indirect, by imposing limitations on the natural units suitable for tillage. One of the most common northern agricultural landscape types is known locally as porech'e, which means an area near a river.

Although everywhere in the forest zone rivers were a natural and practically the only route for distribution of new population, in most areas settlers soon developed the interfluvial plains. However, the interfluvial plains in the northeastern cold zone of older landscapes were preferentially excluded from agricultural development. The short vegetation period allows sustainable agriculture to be possible only in river valleys, where there is a warmer microclimate. Another important factor is that in the case of loam soils, areas within the valley slopes and terraces became suitable for tillage much sooner after snow melt in the spring than did the flat interfluvial plains. Loam soils are in fact more fertile than sandy ones and give a better response to fertilizer, which is necessary in areas of constant tillage.

Our detailed research into this type of agricultural landscape took place within the southern taiga belt at the east of the EEP, on the west bank of the river Kama, between 57°30' and 59°20' NL (fig. 2). This is a region of insecure agriculture, characterized by barren soil and a rather severe temperature regime (table 2). In spite of this, it is a stable centuries-old agrarian area, with agricultural land currently covering from 21 to 53 % of the whole territory, while the forested area makes up from 35 to 67 % of the territory. Interfluvial drainable plains, relict ridges and hills, and river valleys are the most common natural landscapes here. This area was first colonized by Finno-Ugric tribes, who lived along the Kama tributaries, such as the Inva and the Obva starting at the end of the first millennium, surrounded by impenetrable dense forest. The only travel within the habitable region was by river. That is why special earthen and wooden fortresses were built at the river mouths, protecting the routes to the populated areas. Thus, every porech'e developed starting in the 9th century as a growing agricultural landscape, and preserved the same spatial pattern until the beginning of the 20th century. The valleys of the Kama's tributaries differ from the sandy valley of the lower and middle Kama due to their hard loam soil, which could be cultivated only once new techniques using horses and ploughs were introduced. The plough technique does not need as many people and thus the settlement pattern changed: instead of widely distributed large settlements, people lived in numerous small (1-3 farms) ones.

Agricultural landscapes of this type (porech'e) are situated mainly in the north and northeast of the EEP within the area with severe climatic conditions but well developed old river valleys. The complicated and contrasting
environmental conditions rigidly limited the possibilities for agricultural land use and prevented disturbances of
the ecological balance within the area.

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<td>1950</td>
</tr>
<tr>
<td></td>
<td>Valday</td>
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**Western temperate zone of young landscapes**

The western part of the forest zone of the EEP was cultivated very rapidly. If the northeastern porech’e agricultural landscapes grew until approximately the 20th century, according to the land cadastre of the 15th century (Pisztovaya kniga), in the west all areas suitable for agriculture were cultivated by the end of the 15th century. This was a result of rapid population growth due to the presence of river routes for transit between West and East and North and South, which crossed the area. One of the most ancient Russian towns, Novgorod, appeared there as a center of a state starting at the end of the 8th century. At the same time the natural conditions were rather poor. Although the environmental limitations were less strict than in the northeast due to a milder climate (table 2), geological factors played a greater role here. The area affected by the Valday (Würm) glacier is characterized by the most contrasting and mosaic geological and geomorphologic conditions, with young poorly developed and usually boggy river valleys.

However, the first agricultural landscapes were rather productive and large. They are called poozer’e (which in Russian means an area near a lake), and they spread within vast flat plains formed by sandy-loam and loam limnoglacial deposits. The center of these plains is occupied by large lakes of glacial origin. One of the most well known poozer’e agricultural landscapes with Novgorod as its center is situated around Lake Ilmen’. Together with opol’e, poozer’e are the most ancient agricultural landscapes formed by the Slavic population in the forest zone of the EEP. In spite of its rather fertile soil the poozer’e is a young landscape developed only within Valday and Moscow glaciation areas. Older lakes of glacial origin have been drained by rivers and nowadays there
are almost no natural lakes in the east of the EEP. In fact all of these were located within moraine loam sandy kames instead of in boggy young river valleys. Until the 16th century the settlement pattern was the same as in the east: small villages (1-3 farms) surrounded by arable lands at a short distance.

General Land Surveying maps from the 18th century show that at the end of the 18th century the rural settlement pattern changed in the western zone (contrary to the northeastern zone). According to these maps villages were situated on the tops of moraine kames, with an average distance of about 3-5 km between them. At the same time, tillage was spread all over the territory without any conformity with the contemporary settlement pattern. In fact it reflected the previous settlement pattern. Besides safety reasons, increasing village size was useful because it allowed a community to graze cattle collectively and help each other. At the same time in large villages peasants were doomed to lack of near-by arable land, accessible for regular fertilizing. As a result the allotment of every peasant family consisted of separate close and distant strips with “good” and “bad” land. This made forced crop rotation obligatory for every member of a community. The majority of arable land near neglected villages turned to wasteland and the agricultural pattern changed. Before this change arable lands were located mainly within moraine loam sandy kames, while in the 18th-19th centuries the population increased and had to cultivate all of the area, even where the land was not good for agriculture. This caused environmental disturbance, soil erosion, bogging, and hence decreasing crop production.

**Northwestern cold zone of young landscapes**

Generally, this is the zone with the worst combination of natural conditions within the area of intensive agricultural development, as it is characterized by a severe climate and young morainic natural landscapes. This is a zone of very selective spatial agricultural patterns, where populations could not earn their living without other activities, such as handicraft, seasonal work, fur trading, hunting, and fishing. Real agricultural landscapes are located only in special, most favorable natural environments, such as limnoglacial plains (poozer’e of Onega and others) and well-drained flat limestone plateaus with their special fertile calcareous soil (Kargopol’ sush: in Russian, sush means dry land).
Central temperate zone of older landscapes

The central zone is a transitional one (fig. 1) and it is characterized by agricultural patterns inherent to the other zones, including poozer’e, interfluvial (like opol’e) and valley (like porech’e) agricultural landscapes. The change in the settlement pattern within this zone followed that of the western zone but with a certain time lag. Generally, the zone was characterized by larger agricultural plots than in the west and their pattern changed several times due to non-strict natural limitations and high social pressures.

Conclusions

Our research shows intimate interrelationships between natural conditions and agricultural and settlement patterns. In fact, the strictness of natural limitations determines possible spatial agricultural patterns under certain social, economical and technological circumstances. Two natural trends, climatic and geological, determine agricultural development within the forest zone of the EEP, forming five zones with different types of spatial agricultural patterns (types of historical agricultural landscapes). The most common types of agricultural landscapes formed under different natural conditions have their own historical names: “opol’e”, “poozer’e”, “porech’e”, “sush”. The agricultural spatial pattern in the east and south of the EEP (porech’e, opol’e) has been maintained since the beginning of agricultural development more than 1000 years ago. On the other hand, the spatial agricultural pattern in the west and the center of the forest zone repeatedly changed following corresponding displacements of the population. Nevertheless, even in this case agricultural lands still prevail only within certain geological units and thus we can determine the spatial framework for extinct settlements in different natural conditions.

References


