Environment and economic activities of Neolithic and Bronze age populations of the Northern Pontic area

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ABSTRACT

Available archaeological and archaeobotanical evidence shows that the colonization of the Ukraine by agrarian tribes occurred in the Atlantic and at the beginning of the Subboreal periods of the Holocene. Conditions were quite favourable for agricultural activities. Under conditions of a dry Subboreal climate with the frequent occurrence of droughts and cold spells, significant changes occurred in the economy, social structure and material culture of the populations. The Bronze Age economy in the steppe of Ukraine was based on pastoral stock-breeding and agriculture.

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1. Introduction

In recent years, the archaeologists of the Institute of Archaeology, Academy of Sciences of Ukraine carried out investigations of the economy of several prehistoric and early historic groups. Pollen analysis and studies of plant remains provided insights into the changes in subsistence and in the environment. This paper sums up the palynological data regarding the vegetation cover on the North Pontic Area in the Holocene as well as archaeobotanical materials and their interrelations.

2. Materials and methods


3. Results

Palynological research of the Mirnoye and Beloles’e sites, located in the western part of the Odessa Oblast (Figs. 1 and 2) (Pashkevich, 1976, 1982) indicates that the vegetation cover of the modern steppe zone changed in the Holocene. Presently this area of Pontic Lowland is a treeless steppe, accompanied by typical xerophytic vegetative cover with Stipa ucrainica P. Smirn., Stipa Lesingiana Trin., Stipa capillata, Festuca sulcata Hack., Koeleria gracilis Pers., and an admixture of Lynosyris villosa (L.), Limonium sapertanum (A.Beck Gams), Medicago romanica (Prod.), and Tanacetum millefolium (Tzvel.). Salt-marsh plant communities commonly occur on river flood-plains and ravine bottoms (Fig. 2).

In the Holocene, based on the obtained pollen spectra from the Beloles’e site, vegetation consisted of a Gramineae-mixed herb steppe with poorly developed grass cover as well as commonly occurring open soils, salt-marshes and small water bodies surrounded by mesophytic meadows and rare alder trees. This type of vegetation remained in place during the entire Preboreal and Boreal periods. The limited amount of tree pollen suggests limited tree cover along the slopes of river valleys and estuaries.

The flotation of cultural deposits at the Mirnoe identified the seeds of lambs quarters (Chenopodium album); doorweed (Polyg-norum convolvulus); strangle-tare (Vicia hirsuta) and sheep sorrel (Rumex acetosella). Supposedly, these wild growing plants were part of the Mesolithic diet. It is known that food-gathering played a significant role in the subsistence of prehistoric communities. Seeds of these plants are frequently identified in cultural layers. In some areas they still are used for food.

In the eastern part of the Ukrainian steppe, the pollen data were obtained for several Mesolithic sites and early Holocene deposits at...
Zimovniki, Rogalik 2, Rogalik 12, Peredelsk and Podgorovka (all in the Lugansk area). The studied deposits are of Preboreal (9.5 ± 110 ka BP) and Boreal age (8.5 ± 1.0, 8.6 ± 0.9, 8.1 ± 120 ka BP) (Gorelik, 1986; Gerasimenko, 1995, 1997a, 1997b).

From the pollen evidence, the watersheds were occupied by steppe communities, and mesophytic communities existed in the river valleys and ravines. Forests covered the watershed slopes and included oak, elm and hazelnut, with alder on wetter ground. This type of vegetation was fairly similar to that of the present-day Central Russian Upland (Isaeva-Petrova, 1976). The increased abundance of steppe xerophytes and the decreased amount of arboreal macrofossils indicates that the climate by the end of the Preboreal became cooler and drier.

The pollen data for Mesolithic sites on the Kerch Peninsula in the eastern Crimea: Lugovoye I and II, Leninskoye and Frontovoye (Mackey and Pashkevich, 1973), shows that the steppe vegetation in that area had a more mesophytic character as compared to the present time, and consisted of bunchgrass communities with sparse forests and aquatic vegetation with *Sparganium*, *Hydrocharitaceae* and *Lycopodium* along water courses.

The occurrence of the highest values of tree pollen such as pine and broad-leaved oak, elm and lime in Belolesye and Mirovye marks the Atlantic period. The prevalence of Chenopodiaceae, Asteraceae and various herbs indicates a meadow steppe (Pashkevich, 1976, 1982). In the western areas, in particular in the lower stretches of the Dniester River (Moldova), the vegetation cover of the modern steppe zone during the second half of the Atlantic period had a mesophytic character (Volontir, 1989; Kremenetskiy, 1991, 1997, 2003).

The Neolithic-Eneolithic periods coincided with the Atlantic period known as the Holocene climatic optimum. The climate in the interval of 6000–4500 BP was less continental than presently. Winters were mild and the average annual temperature was higher than now by 2 °C. In the steppe zone the January temperature was 1 °C higher than the modern one and that of July, 2 °C lower. The annual precipitation was 100–150 mm higher than now (Kremenetskiy, 2003; Velichko et al., 2009).

The pollen evidence indicates spread of mixed coniferous-deciduous forests in the river valleys during the Atlantic period. Forest-steppe with isolated groups of oak, elm, lime and maple became dominant on the plateaus. Thermophilous trees increased in the structure of forests, which moved further to the north and east as compared to their present position. Valleys of the Dnieper, Dniester, Southern Bug, Don and Volga were forested. The broad-leaved trees penetrated into the steppe zone, which was considerably reduced, being restricted only to the southern edge of the Pontic Lowland. Grassy cover became more mesophytic, with the abundance of meadow plants in its composition (Dolukhanov and

The vegetation history of the North Pontic steppe zone is based on the pollen evidence from the Kardashinskoe bog, the southeasternmost one in that area. Graminaceae-wormwood steppes with small patches of pine and birch trees were spread on sandy terraces of the Dnieper. Forests with elm, oak, lime, hornbeam, ash, and sites of meadow steppes grew on the flood-plains. In the second half of the Atlantic and the subsequent Subboreal period (4.5–4.2 ka BP), the vegetation cover consisted of broad-leaved trees and pine forests with birch on sandy terraces of the Dnieper. The grass cover became more mesophytic with the spread of steppe-meadow and steppe communities (Kremenetskiy, 1991). The southern foothills of the Volyn-Podilsk and Dnieper Uplands, presently in the northern steppe zone, were covered with forest-steppe vegetation (Kremenetskiy, 1991; Gerasimenko, 1997b).

Typical steppe spectra dominated by Chenopodiaceae and Compositae with a limited occurrences of trees (pine, birch, alder, elm, and oak) have been identified in the deposits of Early Neolithic site of Kamennaya Mogila, located on the floodplain of the Molochnaya River (Melitopol Oblast, Ukraine). Kremenetskiy (1991) reported the pollen data for Orgeyev (Orhei) palaeolake profile, a lake which is presently located in the steppe area of the Dniester-Prut watershed at Moldova. The Atlantic period spectra show the occurrence of broad-leaved forests alternating with bunchgrass steppe.

A similar character of the vegetation cover dynamics has been identified in the eastern part of the steppe zone. Graminaceae-mixed herb steppe with limited flood-plain forests occurred there over a prolonged period, as has been demonstrated by palynological records from Mesolitich sites on the Ker’ch peninsula (Mackevo and Pashkevich, 1973). Limited contents of heliophytes, xerophytes, xerohalophytes and halophytes are typical of the florae.

Palynological data obtained for the multilayered site Razdol’ NOE (Donet’ Oblast) support this conclusion (Bezus’ko et al., 2006). This site is located on the right bank of the river Kalmius in the steppe with limited occurrences of hardwood forests in the ravines. The early Neolithic layer has been radiocarbon-dated to 5825 ± 80 BP [Ki—8004] and 5630 ± 90 BP [Ki—8005]. Pollen spectra obtained for Early and Middle Chalcolithic layers show the prevalence of steppe-like vegetation with an abundance of mesophytic grasses and the occurrence of broad-leaved forests which included hornbeam and alder. The occurrence of Cerealia pollen indicates agriculture, a conclusion further corroborated by ethnobotanical evidence for cultivation of hulled wheat, hulled barley, and millet.

Following the Altithermal, which on East European Plain is generally estimated as 5.6–5.3 ka, the pollen spectra of eastern Ukraine indicate a reduced precipitation with mean annual temperatures remaining above the present-day values. Increased rate of Chenopodiaceae was caused apparently not only by the climate change, but also by human impact.

The Neolithic and Chalcolithic periods in Europe broadly coincided with the Atlantic period. The corresponding conditions were quite favourable for agricultural activities. Early agricultural tribes arrived from southwest Asia through the Balkans.

P. Dolukhanov suggested, based on radiocarbon dates, the following chronology for the spread of early Neolithic agriculture in southeastern Europe: the earliest agricultural cultures at 8.6–7.5 ka cal BC (Franchthi Cave); the next stages of early Neolithic in Central and Northern Greece include Proto-Sesklo (6.5–6.0 ka cal BC) and Sesklo (6.0–5.3 ka cal BC). Further north, in the northern Balkan area and Middle Danube basin, several early farming cultures were recognised, including Karanovo I–II (6.1–5.8 ka cal BC); Karanovo III (5.4–5.1 ka cal BC), Karanovo IV (5.3–4.8 ka cal BC), Starcevo-Körös-Criş (5.9–5.5 ka cal BC) and Vinča (5.5–4.0 ka cal BC) (Dolukhanov et al., 2004, 2005). Available archaeological and archaeobotanical evidence shows that colonization of the Ukraine by agricultural tribes occurred in the Atlantic and at the beginning of Subboreal period of the Holocene.

Two points of view exist on the presence of agricultural tribes in the territory of Ukraine. The first one links the appearance of first farmers with the Starcevo-Körös-Criş (5.9–5.5 ka cal BC) and the Bug-Dniester Culture. The second point of view advanced by Danilenko (1969) and supported by Kotova (2002) argues that the population of the Bug-Dniester Culture received the skills of plant cultivation from the inhabitants of the steppe Azov Sea area at about 5600–6400 BC.

Early farming Starcevo-Körös-Criş communities in the Balkans (7500–7500 BC) spread east of the Carpathian Mountains, reaching Moldova and western Ukraine. Study of the culturally related site of Sakarovka I in Moldova yielded the imprints of grains of emmer wheat, spelt, hulled and naked barley, millet(?), and pea and bitter vetch among the pulses. Charred grains of emmer and spelt, two fragments of pea, together with grains of Setaria viridis and Setaria glauca, seeds of Calium sp and Polygonum sp., and imprints of Alfissum sp., Agrostemma sp., and Setaria sp. were identified on the plaster house platforms. The late Natufian phase could be characterized by weeds or elements of the local vegetation (Kuzminova et al., 1998). Cultivated plants indicated in archaeological deposits of the Neolithic Bug-Dniester culture are generally considered as resulting from the Starcevo-Criş influence.

About 30,000 fragments of pot sherds ceramics from 40 settlements belonging to the Bug-Dniester, Surskiian, Azov-Dnieprovskaya, Donetskaya, and Kiev-Cherkasskaya cultures were analysed in order to identify traces of plant cultivation. The quantity of imprints was poor, as usually the case, and only eight out of 18 investigated settlements of the Bug-Dniester yielded identifiable plant imprints, at located in a forest-steppe zone. They consist of rare imprints of grains of hulled wheat, barley, probably millet, and seeds of linum. An easily identifiable imprint of emmer spikelet has been found on a pot sherd from Zan’kivs’kyi (Kotova and Pashkevich, 2002). At the sites on the Dniester River (Soroki 1, 3, 5, Ruptura and Sakarovka I), apart from the above-mentioned species, the imprints of spelt, naked barley, and oats (Avena sp.) were identified (Yanushevich, 1989). The pottery of the southernmost sites, Pugach and Gard, shows no plant imprints. Researchers think that animal husbandry was the basis of the local subsistence (Zhurav’lo and Kotova, 1996).

Only with the appearance of tribes of the Linear Pottery Culture, estimated as 5154 ± 62 BC (Dolukhanov et al., 2005) can the existence of farming on the territory of Ukraine be confidently asserted. The bearers of this culture brought with them skills for cultivating domesticated plants (mainly wheat and barley).

Settlements of this culture are known from two areas: the north-western part of Ukraine (the province of Volhynia) and the Middle Dniester (Moldova and Ukraine). The composition of cultivated plants is identical to that from contemporary sites in other areas of the Linear Pottery culture in Europe (Knörzer, 1991; Wasylikowa et al., 1991). Hulled wheat and barley with legumes (mainly peas) and bitter vetch formed the basic crops. Bread wheat also was recorded, but as a small admixture only.

Tribes of the Tripolye culture spread over the greater part of the modern forest-steppe zone, from the Prut up the Dnieper. Based on the calibrated 14C dates, the age of the Tripolye culture covers the period from the 5th until the 3rd millennia BC. It corresponds to the second half of the Atlantic–beginning of the Subboreal period of the Holocene. The palynological data shows that forest-steppe vegetation was dominant in the Tripolian landscapes (Pashkevich, 1989, 2005; Kremenetskiy, 1991; Yanushevich et al., 1993).
Meadow forest-steppe formations included forests with oak, lime, elm, hornbeam and mesophytic grass-herb meadow formations.

The Tripolye culture is an outstanding phenomenon in European prehistory. Tribes belonging to this culture manufactured high-quality painted ceramics, built two-storey houses and were able to process copper over the period of 2500 years.

The Tripolye culture included three subsequent stages. The earlier indications of Tripolye culture are known from Rumania (Precucuteni I). The Precucuteni tribes occupied the dry steppe and as well as foothills of the Carpathians. Groups Precucuteni 2 (Tripolye, stage A) spread rapidly to the east, into the valleys of the Dniester and later the Southern Bug. During the next period (Tripolye, stage B), under the conditions of much wetter Atlantic climate, they reached the Middle Dnieper. The settlements at that time became both larger and more numerous.

Tribes of the Tripolye culture disappeared under conditions of a dry Subboreal climate. However, even at this final stage they occupied a vast area not restricted exclusively to the forest-steppe zone. Some groups penetrated further into the forest area in the north and into the steppe in the south. The grass-herb steppe was replaced by the grassy variety, while the area of forests was considerably reduced. These changes were reflected in the character of the economy. The economic activities became complex, combining agriculture with animal husbandry. At this time, nomadic groups appeared in some areas of Eastern European and in the Siberian forest zone. Agricultural communities in the forest-steppe zone of Ukraine and Moldova rapidly diminished, as the natural conditions became more favourable for the development of cattle breeding, either of nomadic or of semi-nomadic character (Dergacev, 1991).

Numerous remains, including palaeoethnobotanical materials, were found. Some researchers blame a catastrophic flood for the disappearance of this culture. However, scientists assume a gradual, five centuries long, disappearance of this ancient culture as a result of climate changes.

Plant remains were recovered from nearly one hundred Tripolye settlements in Moldova and Ukraine. As the archaeobotanical studies show, the early Tripolye assortment of cultivated plants remained fairly uniform throughout all three major stages of the Tripolye culture. The dominant species of cereals were hulled wheat: emmer (which prevailed), einkorn and spelt supplemented by naked six-row barley and hulled barley. Bread wheat/club wheat formed small admixtures to other cereals. Broomcorn millet was less common. The list of cultivated plants includes Pisum sativum and Vicia ervilia. Values of millet increased only in settlements on the border of the steppe zone with tribes of the Usatovo culture in Tripolye C (Yanushevich, 1976, 1986; Pashevkivich, 1980, 1991, 2003, 2005; Kuzminova, 1990). Minor variations are observable only in relative importance of these plants.

Assemblages of cultivated plants and land - usage systems did not change for a long period. The arable lands were continuously cultivated without any improvement and or fallow periods. The fields were cultivated by means of horn and stone hoes and antler “listers” which made the soil friable. Such soil was favourable for seeding ears of hulled wheat. The harvesting method by which only the ears were taken was used. Low yields, long periods of natural soil regeneration, primitive tools for tilling the fields and harvesting as well as the use of undemanding species of cultivated plants were the basic features of Tripolye agriculture. Tripolye culture palaeoethnobotanical materials obtained in the entire area of its existence has shown that the plant assortment used by Tripolye tribes considerably differed from those used by the tribes east of the Black Sea. As Yanushevich (1989) has demonstrated, the basic cultivated plants in the south of Central Asia and in the Caucasus were bread wheat and special varieties of naked barley with round grains. Palaeoethnobotanical analysis of materials from a group of Usatovo settlements (final Eneolithic of the steppe zone): Bolshoy Kuyalnik, and Mayaki indicated that millet was the basic staple plant food of the local agro-pastoral populations (Kuzminova and Petrenko, 1989).

According to Gerasimenko (1995, 1997b), following the maximum temperature rise in an interval of 5600–5300 BP, a period of reduced precipitation with mean annual temperatures higher than now followed in the steppe zone of Ukraine. Numerous climatic oscillations occurred after 2800 BC. The Early Subboreal (1.4C 4.6–4.3 ka BP) was cool and wet: forest-steppe spread to the south, but broad-leaved trees were reduced. The Middle Subboreal (1.4C 4.2–3.5 ka BP) featured a very dry climate. Artemisia-Poaceae steppe dominated the southern and eastern part of the area. During the Late Subboreal (1.4C 3.4–3.0 ka BP), xerophytes disappeared and broad-leaved forest-steppe spread in the western and northeastern parts of the area. The end of the Late Subboreal (2.9–2.7 ka BP) was dry, and steppes consisted of Poaceae and xerophytes. Reduction of forest cover in the river valleys, various herbs and trees were also noted. The steppe became more arid-resistant with a notable increase of xerophytes and especially Chenopodiaceae.

However, the latter could be a result of both climatic changes and human economic activities. The sedentary-type Bronze Age communities existing during the wet phases were replaced by nomads during the dry episodes. During the Subatlantic period, 2.6–2.2 ka BP, the forest-steppe penetrated into the northern part of the area. Later, alterations of mesophytic and xerophytic-type steppe were noted. The driest phase was identified at 2.1–1.7 ka BP, and the wettest cool phase was noted at 1.6–1.4 ka BP. The Medieval climatic optimum and the Little Ice Age are noted, particularly in the western areas and in the foothills of the Crimean Mountains (Gerasimenko, 1997b).

The steppe zone from the Danube in the west to the river Molochnaya in the east was dominated by the tribes of the Nizhne Mikhailovka culture, as well as those of Pivikha culture, further up the Dnieper River. The quantity of identifiable imprints of cultivated plants on fragments of pottery of these cultures is very low. Only ten imprints were identified on 2461 fragments from the bottom layer of Mikhailovka I settlement (Nizhne Mikhailovka culture). They include: Triticum dicoccon - 4 imprints, Hordeum vulgare - 4, Panicum miliaceum - 1, Vicia sp. - 1, as well as an unidentified cereal and a seeds. However, the numerous finds of antler hoes together with plant imprints at the Dereivka settlement indicate a primitive agriculture in these locations.

The Bronze Age coincides with the Subboreal period. Under the impact of climate with common droughts and cold spells, significant changes are notable in the economy, social life and material culture of the Central and East European populations.

The Bronze Age economy in the steppe of Ukraine was based on pastoral stock-breeding and agriculture. The Yamnaya Culture tribes emerged during the first half of the Subboreal period, accompanied by an increasingly dry climate and the expansion of the steppe. These tribes spread over the vast territory of steppe and forest-steppe area from the Urals in the east to Dobrudzha in the west. The Yamnaya tribes existed in the Ukrainian steppe for 400–500 years, beginning with the second half of the third until the beginning of the second millennium BC. Contrary to widely accepted opinion that the pastoral stock-breeding was the base of the subsistence of these tribes, at some sites, particularly along river valleys, they practised agriculture.

A sack filled with spikelets of T. dicoccon and Triticum monococcum, found in the early Catacomb burial site at Bolotnoe in the Crimea, demonstrates the existence of an agrarian component in the economy of Catacomb Culture tribes of the Ukraine and Moldova steppe zones (Yanushevich et al., 1981).
Similar data are also available from the western steppe area. The imprints of grains of millet and naked wheat were identified on the vessels of the Catacomb culture at Minnore (Kuzminova and Petrenko, 1989). A limited assortment of cultivated plants was highly adaptable to the agricultural practices of nomadic and seminomadic tribes. Hulled barley equally withstands a dry climate and poor soils. barley is one of the principal cereals, both for human diet as well as an important fodder for domestic animals (Zohary and Hopf, 1988). Common millet is the preferred staple food amongst traditional nomadic tribes, who appreciate its special qualities—a small sowing bulk, short life-cycle and drought resistance (Vavilov, 1987).

The quantity of imprints of cultivated plants identifiable on fragments of Yamnaya culture pottery is very low. Only six imprints were acknowledged on 3629 fragments from Mikhailovka 3 settlement: T. dicoccum – 3, H. vulgare – 2, and a single imprint of P. miliaceum. Imprints of grains of millet (6) were most numerous at the Skelya-Kamenolomnya settlement. Wheat grains were found only in two cases. They are atypical and likely belong to Triticum aestivum s.l. In total, 4038 fragments of ceramics were investigated. The imprints of grains, “forks” and straw of Triticum compactum, T. monococcum, H. vulgare, and P. miliaceum were found on burial vessels from four settlements on the Lower Dniester, in the western part of the Yamnaya culture area (Kuzminova and Petrenko, 1989).

The period from 2800 BC onwards featured numerous climatic oscillations. In the interval between 1500 and 900 BC, precipitation was 100 mm higher than now, the July temperature was 2°C lower, and January by 1°C lower. The forested areas in the vicinity of the site and the ruderal vegetation in the vicinities of the Dniester valley have increased (Gerasimenko, 1997a). These changes in the natural conditions affected the character of the economy.

The existing botanical records show that agriculture became more important in the economy of the Middle and Late Bronze Age. Agricultural practises intensified when the Sabatinovka tribes spread into the south of the forest-steppe and into the steppe zone proper. Twelve Sabatinovka sites yielded particularly informative evidence. Thirteen thousand fragments of ceramics and 20 kg of daub were studied. Grain imprints include hulled and naked wheat, hulled and naked barley, millet, and pulses. Collection of charred grains and seeds was obtained within the limits of the economic complex at the site of Vinogradnyi Sad by in total, 4038 fragments of ceramics were investigated. The imprints of grains, “forks” and straw of Triticum compactum, T. monococcum, H. vulgare, and P. miliaceum were found on burial vessels from four settlements on the Lower Dniester, in the western part of the Yamnaya culture area (Kuzminova and Petrenko, 1989).

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The vegetation of Northern Black Sea Coastal area during the Holocene had a steppe-like character. At the beginning of the Holocene, the steppe was more drought-resistant than now. During the Holocene optimum (Atlantic period), increased humidity had a significant influence on the character of the vegetation cover. Under the influence of the milder climatic conditions the vegetation took the form of Gramineae-mixed herb steppe with a poor grassy cover, and commonly occurring open soils, salt-marshes and small water bodies surrounded by mesophytic meadows and rare alder trees. There were small forest patches with some deciduous trees. Favorable conditions in the Atlantic favoured the spread of industries-breeding appears to have been the base of the subsistence economy of the Pokrovskaya culture, and an agricultural/animal industries-breeding economy was characteristic of the Berezhnovsko-Maevskaya. Thus, within the huge territory of Eastern Europe during the seventeenth to thirteenth centuries BC, both animal industries-breeding and agricultural/animal industries-breeding subsistence economies were of major importance. A wide spectrum of the plant remains has been identified at Usovo Ozero site in Donetsk Oblast (Pashkevich, 1991, 2000) and in two settlements Bezimennoe 1 as well as in Donetsk Oblast and Pavlovgrad in the Dnepropetrovsk Oblasts (Cernych et al., 1998; Lebedeva, 2005). The most important cereals were barley, millet and hulled wheat. The records from the sites of Veseloe 1 and 1-st May at Moldova have revealed insignificant quantities of cereal grain imprints. Only emmer, barley and millet were found (Yanushkevich, 1986). A wide spectrum of cultivated plants has been identified at Usovo Ozero. In addition to the species listed above, imprints of bread wheat, naked barley, V. ervilia, Aveno sp. and Secile sp. have also been identified (Pashkevich, 1991). Floation of the infilled holes and constructions at Dikiy Sad near Nikolaev (Belozerskaya Culture, 12th–10th centuries BC) produced grains of barley, millet, naked wheat, and hulled wheat, as seeds of weed plants.

Bronze Age plant husbandry is documented by the records from sites in Europe (Wasylkowska et al., 1991). Emmer was one of the most common cereals. Eincorn was less important. Barley gained in importance, as compared to the Neolithic. Bread wheat appeared more often than in the Neolithic but always in small numbers. The significance of millet also increased. Rye became more common, but E. Hainalová (personal communication) believes that it remained a weed in the crops of wheat and barley. Pulses were represented by pea, lentil, and bitter vetch. Horsebean and chickpea were rare. There are rare finds of Camelina sativa and L. usitatissimum.

Archaeobotanical materials from the steppe zone differ considerably by the very limited assortment of cultivated plants, showing an adaptation both to environments and cultural traditions. Hulled wheat is characterized by indiscriminateness to soil and to climatic conditions (Stoletova, 1924–1925). Hulled barley easily adapts to a dry climate and infertile soils. Barley was one of the most popular crops in the past. It was used both in the human diet and for feeding the animals. Millet is most common cereal among the traditional nomadic tribes due to its high calorific content and, a short cycle of development, good sustainability during droughts, and the small volume of grains necessary for a crop.

In spite of technical progress, attained with the use of bronze sickles, plant husbandry remained essentially the same as in the 3rd–2nd millennia BC. It was characterized by a long-fallow system, primitive agricultural technology and a constant development of virgin lands. Environmental changes were responsible for changes in economic activities. Animal husbandry and agricultural farming alternated in response to climate changes.

4. Discussion

The vegetation of Northern Black Sea Coastal area during the Holocene had a steppe-like character. At the beginning of the Holocene, the steppe was more drought-resistant than now. During the Holocene optimum (Atlantic period), increased humidity had a significant influence on the character of the vegetation cover. Under the influence of the milder climatic conditions the vegetation took the form of Gramineae-mixed herb steppe with a poor grassy cover, and commonly occurring open soils, salt-marshes and small water bodies surrounded by mesophytic meadows and rare alder trees. There were small forest patches with some deciduous trees. Favorable conditions in the Atlantic favoured the spread of
agricultural tribes into the forest-steppe zone, especially the Tripolye culture. The steppe zone economy had a mixed character. It was characterized by a long-fallow system, primitive agricultural technology and a constant development of virgin lands. Environmental changes affected changes in economic activities. Animal husbandry and arable farming alternated. Food-gathering, fishing and hunting as well as agriculture dominated the river valleys.

Deterioration of climatic conditions in the subsequent Subboreal period (late Holocene) led to changes in economic activities, to a gradual diminishing of the role of agriculture and an increased importance of animal breeding. Mesophytic grass-herb steppe was considerably reduced. These changes were reflected in the character of the economy. The economic activities were of a mixed character, combining agriculture with animal husbandry. The number of agricultural tribes in the forest-steppe zone of Ukraine and Moldova was reduced. favourable conditions arose for the development of cattle breeding of a nomadic and a semi-nomadic character. Xerophytic steppe developed under the influence of two factors: the tectonic subsistence of the entire area and the influence of economic activities of cattle breeding tribes. Pastoral digressions under the impact of grazing result in an increased xerophytisation of the vegetation cover (Osiychyk, 1973).

5. Conclusion

Available archaeological and archaeobotanical evidences strongly suggest that the agricultural colonization of the territory of Ukraine occurred during the Atlantic and early Subboreal periods of the Holocene. True farming started only with the appearance of groups belonging to the Linear Pottery Culture which age is estimated as 5154 ± 62 BC (Dolukhanov et al., 2005). They had the skills of cultivating domesticated plants (mainly wheat and barley) and breeding domestic animals.

The tribes of the Tripolye culture spread between the end of the 5th and the 4th millennia BC in the forest-steppe landscapes. Archaeobotanical records of all three stages of the Tripolye culture are similar, with distinctions acknowledgeable only in the relative amounts of plants.

During the subsequent Subboreal period under the influence of climate (droughts, spells of cold) changes, significant changes occurred in the economy, social life and material culture of the populations of Central and Eastern Europe. The Bronze Age coincided with the Subboreal period. At that time, forests in the river valleys disappeared and the share of xerophytic plants in the grass cover of the plains increased.

In the steppe zone at this time, subsistence strategies were based on food-gathering, fishing, and hunting. The economy had a cattle breeding orientation while agriculture was insignificant. The agriculture was focused on river floors and floodplains. Over a prolonged period, the most important cereals remained hulled wheat and barley. In Eneolithic cultures, emmer and barley were more common cereals. Naked barley was replaced by hulled barley during the Eneolithic, accompanied by pulses. Hulled barley and millet were still well represented in the Bronze Age and later. Millet became more popular among the pastoral tribes beginning with the Bronze Age. Such a restricted assortment (T. dicoccon, H. vulgare and P. milaceum) was convenient for primitive agrarian practises. These plants were well adapted to existing climatic conditions.

References


References


