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MANAGEMENT
OF EVOLUTION
OF TILLAGE TOOLS
IN EASTERN EUROPE



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**MANAGEMENT OF EVOLUTION OF TILLAGE TOOLS
IN EASTERN EUROPE**

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PREFACE

The monograph examines the early stages of the historical development of harnessed plowing tools in a large area of Eastern Europe by analyzing a complex of sources, the central place among which is occupied by archaeological and ancient iconographic material. Chronological framework of the study: the end of the III - the beginning of the ii millennium BC. e., when the first steps of arable agriculture are reliably recorded in the southern part of Eastern Europe, until the XV-XVI centuries. The upper chronological limit is determined by the fact that by this time the formation of most of the plowing tools known from ethnographic data has been largely completed.

Plowing tools appeared at a certain stage of the development of the industrial economy. Their emergence was facilitated by man's mastery of agricultural techniques for the cultivation of cultivated plants and successes in the field of animal husbandry, which made it possible to use the power of domestic animals in agriculture. arable agriculture, in fact, transformed agriculture, became its highest achievement, contributed to a significant expansion of cultivated areas¹, obtaining a sustainable additional product in agriculture. ¹[The most primitive plowing tools were 2-3 times more productive than hand tools. According to other data, with the help of a hoe, a farmer could cultivate no more than 0.05 ha per day, with the help of harness tools – up to 1 ha, that is, 20 times more [Gromov H.G., Novikov Yu F., 1967, p. 90].

The spread of arable tools led to the formation of a new group of economic and cultural types – arable farmers, contributed to the creation of conditions for the separation of parcel farming, which was conducted by the forces of one family. Among the arable farmers, the process of maturation of the prerequisites for the formation of the peasantry took place most intensively. Plowing tools also spread among peoples whose economy was based on semi-

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nomadic or nomadic cattle breeding. It is known that in the bowels of the economic and cultural type of pastoralists who moved, there was always a more or less significant agricultural system. The appearance of plowing tools contributed to the expansion of this system.

The historical development of plowing tools will be considered below in two aspects – functional and constructive. The study of plowing tools from a functional point of view makes it possible to trace their development from simple and low-productivity to more complex and productive ones, to reveal patterns of appearance of certain types of plowing tools, their determination by socio-economic, natural-geographical and other factors, provides information on the level of development of agriculture in this or that period, about its systems, etc. Studying the structural features of plowing tools can provide information about certain traditions of their manufacture, which often speak about the origin of the tools themselves, and makes it possible to study them in a cultural and historical perspective.

LIST OF ABBREVIATIONS

- AO Archaeological discoveries
- AP Archaeological monuments of the Ukrainian
- QH Questions of history
- QEHP Questions of the Ethnic History of the Peoples of the Baltic States
- QEHEP Questions of the Ethnic History of the Estonian People
- JMIA Journal of the Ministry of Internal Affairs
- JMSP Journal of the Ministry of State Property
- IA Institute of Archeology of the Ukrainian Academy of Sciences
- BBAS Bulletin of the Bulgarian Academy of Sciences
- PSAMCH Proceedings of the State Academy of Material Culture History
- KSIA Brief reports of the Institute of Archeology of the Academy of Sciences
- KMIA Brief messages of the Institute of Archeology of the Academy of Sciences of the Ukraine
- KSIIIMK Brief reports of the Institute of Material Culture History of the Academy of Sciences
- MIA Materials and studies on the archeology
- MHA Materials on the history of agriculture
- PVL A tale of temporary years
- PHPC Problems of the history of pre-capitalist societies
- SA archaeology
- SE ethnography
- PAC Proceedings... of the Archaeological Congress
- PVEO Proceedings of the Free Economic Society
- PGYM Proceedings of the State Historical Museum
- PIE Proceedings of the Institute of Ethnography of the Academy of Sciences

LIST OF ABBREVIATIONS

- PCAEE Proceedings of the Kyrgyz complex archaeological and ethnographic expedition
- AA Acta archaeologica (Copenhagen)
- AR Archeological roshlegy
- EAF Ethnographic-archaeologische Forschungen
- ESA Eurasia septentrionalis antiqua
- KHKM Kwartalnik historii kultury materialnej
- PZ Prehistorische Zeitschrift
- WA Wjadmoszy archeologicny
- WZ Wissenschaftliche Zeitschrift der Martin Liiter
Universität Halle-Wittenberg

INTRODUCTION

Plowing in its most general form is designed to solve three most important tasks. First, during plowing, a soil structure is created that is most suitable for the penetration of moisture and air, loose enough not to hinder the growth of the roots of cultivated plants. Secondly, in the process of plowing, weeds are destroyed by mechanical destruction of their root system or filling with earth. Thirdly, plowing creates and maintains a more or less level and flat surface of the soil, necessary for carrying out all the subsequent operations of growing plants up to harvest.

According to the general functional features characterizing the impact of the tool on the soil in the process of plowing, traditional plowing tools can be divided into three groups, highlighted by D. Zelenin [Zelenin D., 1907, p. 10-13]: furrows (according to D. Zelenin – those that draw), plows and those that turn the skid, or plow type (according to D. Zelenin – plows). The first ones are characterized by the symmetry of the working part and the absence of shelf devices, they can make only shallow symmetrical furrows, without loosening properly and without turning over the soil. Plowing implements have various shelf devices, thanks to which they not only harrow the land, but also "plow" it, that is, take it with them, loosening and mixing. As a rule, their shelf devices are symmetrical and are not adapted to the rotation of the skiba. Rotary or plow-type tools are characterized by the presence of one-sided shelves, and often with an asymmetric working part, which allows them not only to form furrows, loosen and mix the earth, but also to completely or partially turn the raised piece of earth with the lower part up, pushing it to one side at the same time furrows, make one-sided plowing with rotation of the scythe.

Plow implements are also distinguished by the location of the point of application of traction force, i.e., the place where the base of the implement

(working and controlled parts) is connected to the device for harnessing draft animals. By this feature, tools with a high (at the level of the plowman's hands) and a low (close to the horizontal) place of application of the traction force are distinguished [Naydych-Moskalenko D.V., 1959]. The first ones have a working part placed at an angle to the soil, so that they furrow it from above, or, using the popular expression, "draw" it (drawing tools). The second have a working part placed in a horizontal or close to horizontal position, as a result of which they break the soil from below (breaking tools).

There is still no single and universally recognized classification of traditional plowing tools. However, all researchers recognize the presence of four main groups in the considered territory, the names of which, as a rule, are fixed in the language of different peoples. These are plows, ploughs, plows and harrows. According to the time of emergence, the earliest are the ralas⁴, the latest are the roe deer, which appeared in a period that goes beyond the chronological framework of this work. This division is borrowed from folk practice and is not the result of a scientific classification. However, it fairly objectively reflects certain groups of plowing tools that existed here, given the many specific features of their body structure and functional qualities. According to such groups, plowing tools are also considered in regional historical and ethnographic atlases. Therefore, we consider it possible to study ancient and medieval plowing tools according to these groups, within which varieties differing in functional and structural characteristics will be distinguished.

In the literature, there are often cases of mixing up the names of the specified tools, and the terminology related to their details is also contradictory. Therefore, it is advisable to give brief characteristics of traditional Eastern European plows, plows and plows, which will be supplemented and specified in the future. The names of parts of plowing tools vary significantly in different areas of settlement even of the same people. Here and further, we use the

terminology that most often occurs in special literature, which, in turn, is borrowed from folk sayings.

From a functional point of view, plows can be those that form furrows and plowing tools, have a different position of the place of application of traction force. The only functional feature that unites them is the symmetry of the work. An even greater variety is observed in the rala in the structure of the main parts and the methods of their attachment. We can name only one feature that unites them according to the features of the body structure: all the main parts of the rala are connected to each other on a single line that coincides with the direction of movement of the weapon.

The main parts of the plow are as follows: the working part or plow (Fig. 1, 1, 2, 3, a), which is also called a skid if it occupies a horizontal or close to horizontal position during operation; the handle used to control the tools (Fig. 1, 1, 2, 3, b), which sometimes has a special detail - a handle, which the plowman holds on to during work; shaft to which draft animals are harnessed (Fig. 1, 1, 2, 3, c). In most rala there is also a rack (Fig. 1, 1, 2, 3, d) between the working part and the shaft, which serves to provide rigidity stiffness of the tool in general and adjustment of the plowing depth (Fig. 1, 1, 2, d). Some plows have a metal working tip – a naralnik (Fig. 1, 3, d), as well as shelf devices, which are always symmetrical. In Central and Western Europe, some traditional plows had a wheel front or a shoe that replaced the front, which gave stability to the implement, and a comb, a large iron knife mounted in the shaft in front of the plowshare, which cut the soil in a vertical plane before it was lifted by the working part.

Plows belong to tools with a low point of application of the traction force. The most important functional qualities of the plow, which distinguish it from the plow, are the ability to make a full or partial turn of the blade and asymmetric, one-sided plowing. This is achieved by the presence of a one-sided shelf and the often asymmetrical shape of the working part and its metal tip.

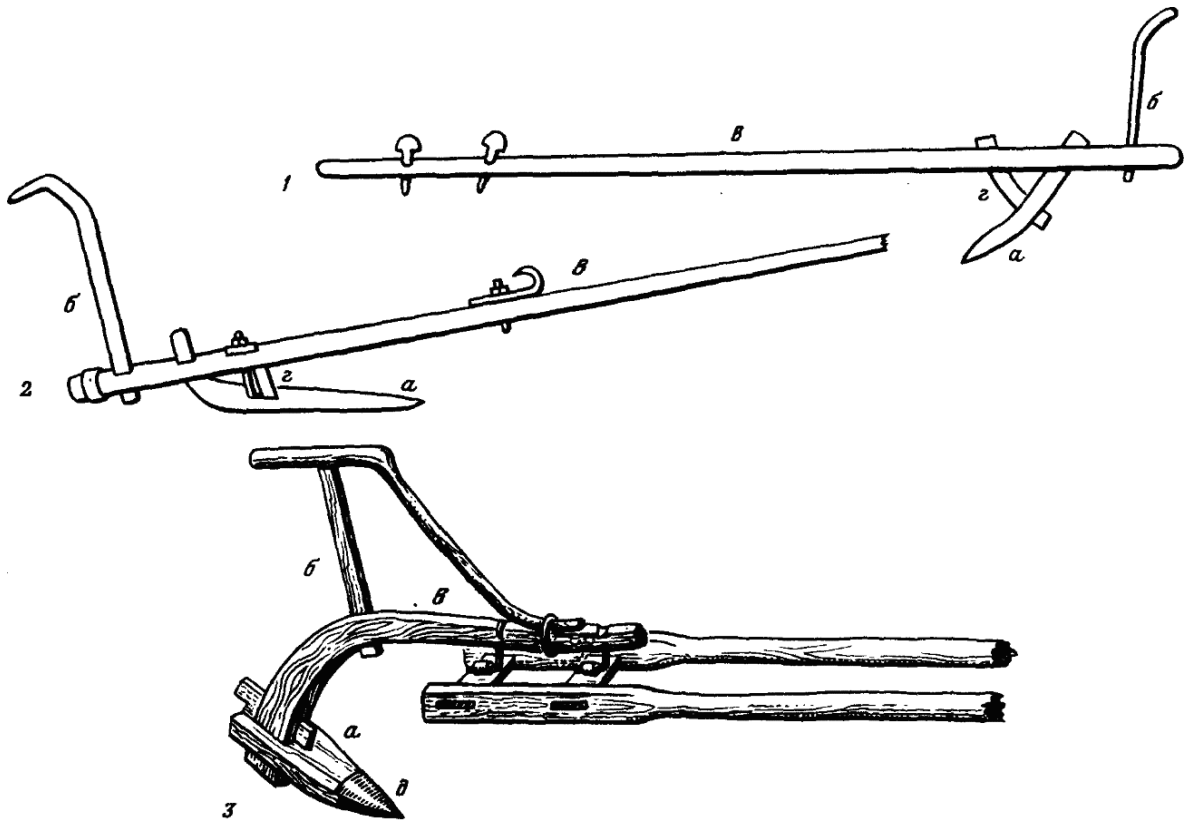


Fig. 1. Rala:

1, 2 – Ukraine; 3 – Estonia; a – working part (ploughman); b – handle; c – shaft;
d – rack; f – naralnik

The main parts of traditional plows are generally the same as in ral: this is the working part (Fig. 2, 1, 2, 3, a), which is always in a horizontal position during work and is therefore called a skid or sole, one or two handles (Figs. 2, 1, 2, 3, b), shaft (Figs. 2, 1, 2, 3, c), column (Figs. 2, 1, 2, 3, d). An indispensable part of the plow is a one-sided adjustable or fixed shelf (Fig. 2, 2, right; in Fig. 2, 1 and 3 the shelves are not shown: they are removed). All plows have a metal working tip called a plowshare (Fig. 2, 1, 2, 3, e). most plows have a comb (Fig. 2, 1, 2, 3, e). A plow is characterized by a front wheel (sometimes, however, absent) and a team of one or more pairs of draft animals.

The plows presented in the ethnographic material in their classic and, as we will try to show below, the most ancient form, the so-called rus plows, according to their main functional features, can belong to furrowing, plowing,

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and plow-type tools. The latter, however, due to the imperfection of the shelves devices can make only a partial turn of the skid. As a rule, they have a high location of the place of application of traction force. A characteristic feature of saws is the two-toothed part of their working part. A one-horse team is typical for soha. According to their design features, they differ from plows and plows in that the working part and the device for harnessing draft animals, which has the form of two shafts (Fig. 3, c), and which are connected by means of a horizontal bar placed perpendicular to the movement of the tool (Fig. 3, b), and the use of soft connections between the working part and the frames, as well as some other points, instead of the rack.

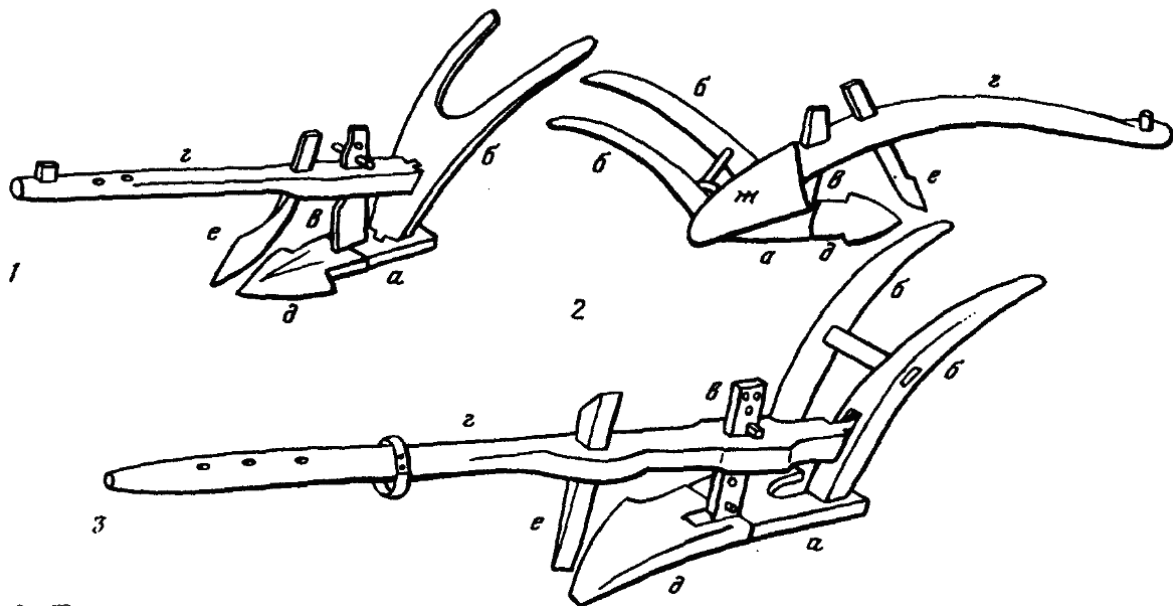


Fig. 2. Plows:

- 1 – Bukovyna; 2 – former Katerynoslav province; 3 – Chernivtsi region;
a – working part (slide or sole); b – sleeve; c – pillar; g – shaft; d – plow;
e – chereslo (chereslo knife); w – shelf

The working part of the saw is called the saw (Fig. 3, a); a device to it for harnessing animals – with ropes or ropes; the transverse beam, which connects

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the rossoha and oglobli, rogalem; soft connections between the rootstocks and rootstocks (Fig. 3, d); a transverse beam between the beams at a certain distance from the log - a crossbar (Fig. 3, d). The metal working tips of the plow are called coulter (Fig. 3, e, k). Plows, which according to their functional characteristics belong to plowing and plowing type tools, also have a peculiar shelf shape (Fig. 3, g, l).

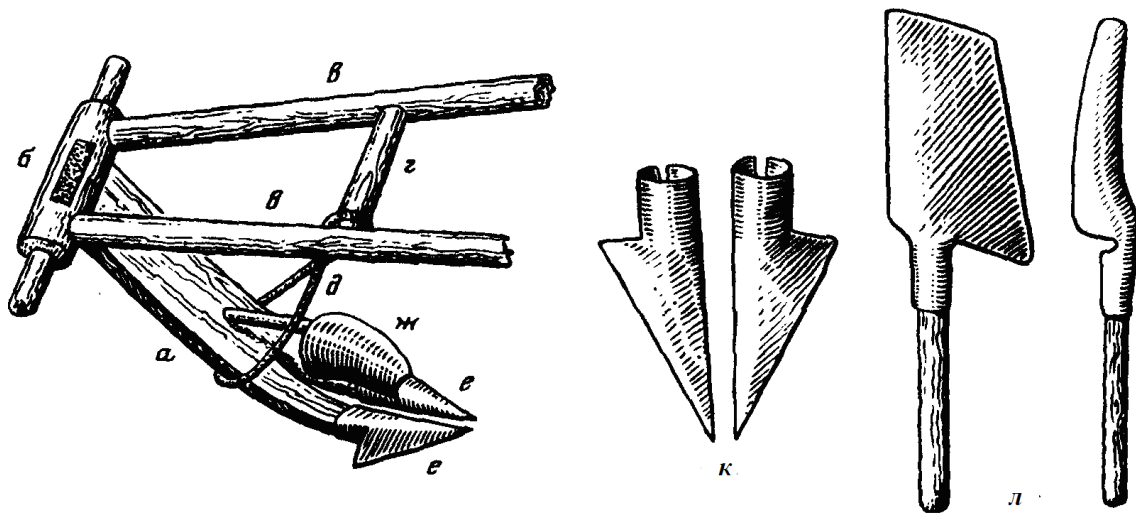


Fig. 3. Soha:

a – desiccation; b – rogal; c – general; d – crossbar; e – rootstock; f – shelf;
i – feather coulter; l – shelf;

Plowing implements are known, which are also called ploughs, but differ from the described form in a number of features that relate them to plows (Lithuanian or Polish ploughs, Estonian plows with "cranes", etc.). We will dwell on their description and the reasons for the peculiarity of the structure below.

Although the roe deer is not the subject of consideration in this work, we note that from a functional point of view it is a plow-type tool with a high or medium location of the point of application of the traction force, and the body structure is similar to a plowshare, differing in a single working part.

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Ethnography recorded another type of harness tools, which were used during plowing and which were called in Russians "drawers" or "cutters". These tools cannot be called plowing tools in the narrow sense of the term: their function was to cut the sodden or heavy soil in a vertical plane, i.e. to perform a preparatory operation during plowing. The working part of such tools consisted of a knife placed vertically, in many cases the same or very close to the blade of a plow or roe deer. According to the design of the case, some of the drafters were similar to plows, some – to plows. These tools did not have an independent value and were used together with a plowshare or plowshare.

Sources for the study of the given problem are few, unevenly distributed over time and by individual regions, and heterogeneous in nature. Archaeological and iconographic sources play a central role. The first include few finds of ancient plowing tools, as well as much more numerous finds of their metal working tips and other iron parts. The latter belong to the relatively late stages of the period under consideration and require a special study to be used as a historical source, to which a special section will be devoted later. Among the iconographic sources we include various subjects of ancient fine art, which include images of plowing scenes, plowing tools and their details. Written sources are of limited importance for our topic: they mostly belong to the later stages of the studied period and, as a rule, do not provide grounds for the characterization of plowing tools, being limited only to stating the very fact of their use. Linguistic data on the origin of nominal tools and their parts have a certain value. However, there are serious disagreements about the origin of these terms. When studying the development of tillage technology, it is necessary to refer to the basic provisions of the science of designing agricultural machines.

Without archaeological and iconographic materials, the problem we are interested in cannot be successfully investigated. However, it is necessary to warn against their overestimation. It is possible to more or less correctly reconstruct ancient plowing tools based on fragments of finds and insufficiently

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realistic images, to understand the nature of their work and the conditions of use, only by going beyond the actual archeological or ancient iconographic material. And here the greatest value for the development of the topic will be ethnographic data - folk plowing tools of the second half of the 18th – early 20th centuries, which are kept in museums, and sometimes in some peasant farms, descriptions of such tools and ways of working with them, made by contemporaries or later based on the materials ethnographic gatherings, descriptions of folk customs related to working with plowing tools, etc.

The importance of ethnographic sources for our topic is very great. Only the study of ethnographic materials makes it possible to reliably reconstruct ancient plowing tools, explain the purpose of certain details, understand the features and conditions of their use, etc. It is no exaggeration to say that archaeological and ancient iconographic materials can be correctly interpreted only in the light of ethnographic data. Ethnographic material, when studied over a wide area, makes it possible by itself to outline certain variants of the schemes of development of plowing tools, to single out typologically earlier and later tools. Checking and supplementing such variants of development schemes with data from archeology, iconography, written and other sources, correlating them with each other, we can approach a more or less adequate characterization of the historical development of plowing tools. Finally, traditional plowing tools known from ethnography are a kind of summary, the result of their centuries-long development, the early stages of which we have to find out. But without a detailed acquaintance with the final stage of the development of any phenomenon, it is impossible to correctly understand the previous stages.

The study of ancient and medieval plowing tools of the territory under consideration and the determination of their specificity is impossible without the study of at least some questions of the historical development of tillage techniques in Europe in general, and sometimes in neighboring regions. Therefore, during the development of the topic, it is necessary to refer to

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archaeological, ancient iconographic, ethnographic and other materials of a wider territory than the European part of our country.

Thus, solving the historical development of plowing tools in the period we are interested in is a complex and complex problem, which is also fragmentarily covered in the sources. Therefore, a necessary and mandatory condition for its development is the involvement of all the data preserved to us about ancient and medieval plowing tools and their use, mobilization and critical understanding of sources of all kinds with mutual correlation of the information that these sources can provide.

The state of the source science base forces us to limit the task to researching only the general direction of the historical development of East European plowing tools, establishing only the main regularities of their change.

CHAPTER 1
STRUCTURAL ANALYSIS OF THE LITERATURE BASE
OF RESEARCH

Analysis of research and publications on the evolution of ancient plowing tools of Eastern Europe showed that this problem was not the subject of a special complex historical and scientific study, which confirms the existence of a small number of historiographical works of the tsarist era, the Soviet period and the modern era.

Previous researchers touched on this problem fragmentarily, many of its aspects remained unexplored and were almost never used in the context of scientific understanding of the problems of the history of science and technology. Among the scientific works of the tsarist era, it is necessary to note the articles of F.A. Teplouhova and A.A. Shtukenberg about the agricultural tools of the "Permian miracle" and the Volga Bulgarians [F.A. Teploukhov, 1882; Shtukenberg A., 1896], from the works of the 1930s. – article by V.I. Maslov on ancient Ukrainian plowing tools based on the materials of the excavations of the Raikovets settlement [Maslov V.I., 1937].

The first publication of the find of an ancient Eastern European plow tool discovered in the Tokariv peat bog in Ukraine dates back to 1952 [D.T. Berezovetsev, 1952]. Subsequently, such finds, as well as images of plowing tools of the period we are interested in, were considered in the articles of B.A. Shramko [Shramko B. A., 1961, 1964, 1969; Sramko V.A., 1971] L.D. Pobola [Pobola L.D., 1967]. Yu.A. Krasnova [Y.A. Krasnov, 19716, 1981], V.I. Bidzily and E.V. Yakovenko [Bydzyla V.I., YakovenkoE. V., 1973], A.V. Chernetsova [Chernetsov A.V., 1977], V.A. Lykhachev [V. A. Lykhachev, 1982]. On this basis, questions were raised about the time of appearance and origins of arable agriculture in Eastern Europe [Shramko B.A., 1972:

Krasnov Yu.A, 1980]. In a number of works by Yu.A. Krasnov and A.V. Chernetsova considered the emergence and early stages of the development of various types of plows, plows and plowshares [Y.A. Krasnov, 1970a, 1971a, 1976, 1979, 1982; Chernetsov A.V., 1972a, 1972b, 1975; Chernetsov A., 1972], periodization of the history of East Slavic plowing tools [Chernetsov A.V., 1972c, 1976], plowing tools of Kyivan Rus and its neighbors [Orlov S.N., 1954, 1956; Chernetsov A.V., 1973; Myrolyubov M.A., 1972, 1980], classification of iron tips of plowing tools from archaeological materials [Chernetsov A.V., 1976; Yu.D. Krasnov, 1978] and some other issues. Partly related to the considered period of the study of the work of N.A. Gorska about plowing tools of the central regions of the Ukrainian state of the XVI-XVII centuries. [N.A. Gorskaya, 1959] and O.D. Gorsky about plowing [Gorsky A.D., 1962, 1963, 1965]. It is likely that the conclusions contained in the works of this group are of the greatest importance for our topic.

Studies devoted to the history of plowing tools of wider regions, usually the Old World in general, very briefly touch on the territory that interests us, are mostly based on ethnographic and linguistic data, far from fully using actual historical sources [Rau L., 1845; Braungardt, 1912; Lesser P., 1931; Werth, 1954; Haudricourt AG, Delamarre MJ, 1955], or, paying considerable attention to the latter, consider only the initial periods of the history of arable agriculture [Brentjes V., 1953, 1954; Krasnov Yu.A., 1975].

Plowing implements and their development are also considered in studies devoted to the ancient and medieval history of agriculture in Eastern Europe. Works of the tsarist era [Belyaev I.D., 1855; V. Sovetov, 1866; N.A. Aristov, 1866; S. Dremtsov, 1899; Rozhkov M.A., 1899] touched only on the agriculture of Eastern Europe, in the part that interests us, they were based on fragmentary data from written sources, which were used selectively and not always correctly interpreted. They ascertained the presence and considered the relative importance of certain plowing tools in the economy; the question of their

historical development, strictly speaking, was not raised.

The agrarian topic in the studies of archaeologists and historians of the Soviet era is much broader. Their works, in particular, discussed the development of arable agriculture in the Bronze Age [B.A. Latynyn, 1957; Krasnov Yu.A., 1967, 1968, 1971; Berezanskaya S.S., 1975], the same problems were intensively developed for the early Iron Age [Anfimov N.V., 1951; P. D. Liverov, 1952; Blavatsky V.D., 1953; Rykman E.A., Yanushevich Z.V., 1966; Shramko B.A., 1961, 1965; Sramko V.A., 1973; Yu.O. Krasnov, 1967, 1968, 1971; Maksimov E.V., 1969; S.P. Pachkova, 1974; I.T. Kruglikova, 1975, etc.]. There are especially numerous studies on agriculture in the Middle Ages - Ancient Eastern Europe of the 10th-13th centuries. [P.Ya. Tretyakov, 1948; V.I. Dovzhenok, 1952, 1961; Kiryanov A.V., 1959; Levashova V.P., 1956; T.N. Korobushkina, 1979; Zverugo Y.G., 1969], Ukraine, XVI-XVII centuries. [Boyko I.D., 1963], The Ukrainian state of the XIV-XVI centuries. [Gorsky A.D., 1959, 1960; Kochyn G.E., 1965], Baltic countries [Dundulene P., 1956, 1968; Doroshenko V.V., 1959; Moora X.A., Leagues X.M., 1964, 1969], Volga region [Stepanov P.D., 1950, 1956; Kiryanov A.V., 1955, 1958; Mukhammedyarov Sh.F., 1959, etc.], Prykamyia [Oboryn V.A., 1956; Ivanova M.G., 1978, 1979] and other districts. The collective work "Emergence and Development of Agriculture", published in 1967, was a unique result of a certain stage of the study of the history of agriculture in the archeology of the Soviet era. It is also necessary to note the few studies on the historical change of agricultural systems [Sovietov A., 1867; V. M. Slobodin, 1952a, 1952b; Yu. A. Krasnov, 1973].

Without the study of the cardinal questions of the development of agriculture, to which these works are specifically devoted, the study of the history of plowing tools of the time under consideration would be very difficult. However, the significance of these works specifically for the development of the history of Eastern European plowing tools, which are allocated in them from a

few lines to many dozens of pages, is very different. The greatest importance in terms of the breadth of the issues raised, the completeness of the sources involved, the methodical instructions and the validity of the conclusions are the works of V.P. Levashova, A.V. Kiryanova and V.Y. Dovzhenka about ancient Ukrainian agriculture [V.P. Levashova, 1956; Kiryanov A.V., 1959; V.Y. Dovzhenok, 1961], A.D. Gorsky about the economy of the peasants of the northeastern Ukrainian lands of the XIV-XV centuries. [Gorsky A.D., 1959, 1960], G.E. Kochyna about the agriculture of Eastern Europe in the second half of the XIII-XVI centuries. [Kochin G.E., 1965].

The issue of the emergence and development of arable agriculture is also raised in many general works on archeology and history of the area in question, but only incidentally to the main topic, and therefore very briefly, sometimes schematically.

Separate excursions into the history of Eastern European plowing tools can be found in studies on traditional agricultural techniques of the recent past. Old literature of this kind largely consists of works of a descriptive and partly classification nature [Firstov G.V., 1854, 1854; A.K. Serzhputovsky, 1910; Moszynski K., 1929; Falkowski J., 1931] and others. Among the studies of the tsarist era, the book by D.K. Zelenina "Russkaya sokha, its history and types", which in many respects has not lost its importance to this day. In it, the author for the first time introduced a production feature into the classification of plowing tools, emphasized the importance of soil, geographical and social factors in the development of plowing tools, outlined the main stages of the history of the Ukrainian plow, spoke about the origin and early stages of the development of plows and plows [Zelenin D., 1907].

Ethnographers of the Soviet era created summarizing works on agriculture and agricultural tools of a number of peoples of Eastern Europe in the second half of the 18th and early 20th centuries – Ukrainians [V.F. Horlenko, I.D. Boyko, O.S. Kynytskyi, 1971], Ukrainians [D.V. Naydych, 1967],

Moldovans [N.D. Demchenko, 1968)], the Baltic nations [I. Leynasare, 1957, 1963; Feoktistova L.X., 1980)], Tatars of the Middle Volga region and the Urals [Khalikov Y.L., 1981]. More or less complete information about the agricultural machinery of other peoples of the European part of the former UKRAINE can be found in the general ethnographic essays of these peoples [Y.V. Nikolsky, 1929; Kryukova T.Ya., 1956; Belitzer V.Ya., 1958; F. Taroeva, 1965; Vorobyev Y.Ya., Lvova A.Ya., Romanov I.R., Simonova A.R., 1965; L.A. Molchanova, 1968] and others. For the most part, some issues of the specific history of certain East European plowing tools were considered on the basis of ethnographic and late historical material [Novikov Yu.F., 1962, 1964; H.G. Gromov, 1967]. Excursions into the ancient and medieval history of plowing tools in such studies are small and do not contain an analysis of all available sources.

Let us turn to the state of development of the most important specific problems of the history of Eastern European plowing tools of antiquity and the Middle Ages.

At the dawn of the scientific study of plowing tools, the driving force behind their change was recognized as the "creative spirit" inherent in humanity, but not equally characteristic of different peoples. The very history of plowing tools was considered as occurring under the influence of the "discovery of flaws" in the design of their cores and the subsequent elimination of such flaws [Rau L., 1845]). Such, in fact, an idealistic view turned out to be quite stable. Thus, R. Braungardt at the beginning of the 20th century, noting that the agriculture of any country largely bears the imprint of its inherent climate, soils and other conditions for the germination of cultivated plants, wrote: "Soil cultivation tools, on the contrary, depend less on these factors than on peculiarities of the activity of the national spirit" [Braungardt R., 1912, p. 181]. In the well-known monograph by P. Leser, which provides a huge amount of factual material about plowing tools of the whole world [Leser R., 1931], the

changes of the latter over time are presented as a kind of self-development, the source of which remains unclear. The fact that plowing tools began to be considered primarily from the point of view of their connection with certain ethnic groups was largely connected with the idea of the determining role of the "people's spirit" in the development of agricultural technology.

For the first time, the great role of physical-geographical and socio-economic factors in the development of plowing tools was pointed out by D.K. Zelenin [Zelenin D., 1907]. Citing a huge factual material as illustrations, he did not, however, formulate clear theoretical conclusions on this matter, and in a number of issues he followed L. Pay and his followers. However, the work of D.K. Zelenina played a significant role in the formation of materialistic ideas about the development of plowing tools.

A peculiar reflection of "hypertrophied autochthonism", which prevailed in a certain period in the archeology of the Soviet era, appeared the opinion of P.P. Tretyakov, that the genesis of each plowing tool should be sought in the specific history of farming in the area where this tool was used in the recent past [Tretyakov P.P., 1932, p. 25].

By the middle of the 20th century, science gradually formed the idea that the development of plowing tools is determined by various factors, both socio-economic and ecological, as well as cultural and historical. In plowing tools, they began to distinguish features that are determined, on the one hand, by the physical and geographical conditions of their use, the technology of agricultural production, etc. (functional features), and on the other hand, independent or relatively independent of these circumstances (so-called formal features), which are revealed mainly in the peculiarities of the structure of the gun case and reflect primarily cultural and historical, in particular - ethnic, traditions [Haudricourt AG, Delamarre M. J.-V., 1955; Bratanic B., 1955, 1957]. However, the significance of the specified groups of factors in the specific history of plowing tools is not assessed by different researchers in the same way.

Y.F. Novikov and H.G. Gromov [Novikov Yu.F., 1963; Gromov H.G., Novikov Y.F., 1967].) in a rather categorical form expressed the opinion that the division of the features of plowing tools into functional and formal is illegitimate, that "the plow frame is not a detail independent of the soil and climate" [Gromov H.G., Novikov Y.F., 1967, p. 88].) that "all the variety of types and forms of plowing tools testifies exclusively to their adaptability to various conditions of use, both soil-climatic and socio-economic" [Novikov Yu.F., 1963, p. 111]. Thus, in fact, the very possibility of researching plowing tools in cultural and historical aspects was removed. This point of view caused fair criticism during a long (1967-1976) discussion on agrarian ethnography in the pages of the journal "Soviet Ethnography". However, the development of Y.F. Novikov and H.G. Gromov on the influence of ecological and socio-economic conditions on the development of agricultural machinery [Novikov Yu.F., 1962, 1963, 1964; H.G. Gromov, 1967, 1976; Gromov H.G., Novikov Y.F., 1967] played a positive role.

In the literature of the Soviet era, there was a prevailing opinion that the development of plowing tools was determined by a complex of factors, among which the socio-economic conditions of society, the natural and geographical environment, the technology of agricultural production, including the dominant farming systems, and the nature of the lands that were mainly cultivated [Levashova V.P., 1956; D.V. Naidych-Moskalenko, 1959; V.Y. Dovzhenok, 1961; Yu.F. Novikov, 1963, 1964; Gromov G.L., Novikov Y.F., 1967; H.G. Gromov, 1967, 1976; A.S. Bezhkovich, 1971; Chernetsov A.V., 1972, 1975; Krasnov Yu.A., 1975; Andrianov B.V., 1976)], as well as various cultural and historical [Chesnov Y.V., 1972; Ya. Kramarzyk, 1974; Krasnov Yu.A., 1975; Chernetsov A. V., 1975)] or ethnic [Saburova A. M., 1967; A.S. Bezhkovich, 1971; Andrianov B.V., 1976; To the results of the discussion on agrarian ethnography, 1976]. It should be noted that the problem of factors affecting the development of plowing tools was considered mainly on

ethnographic materials for traditional tools that had already been formed, without the necessary reference to their specific history.

Questions about the forms in which the historical development of plowing tools takes place have not been sufficiently studied. In the first scientific studies on agricultural machinery [Lasteyrie G., 1821; Rau L. 1845] as the main one, a purely evolutionary path was outlined and characterized in detail - a path of gradual accumulation of small and initially imperceptible changes, which ultimately led to the appearance of new types and forms of plowing tools. The idea that their development is an extremely slow empirical search for the most acceptable forms in given specific conditions by the method of "trial and error", that new types and varieties of plowing tools are created as a result of slow and gradual evolution through a series of transitional types from the old model to the new, continues to exist and in the 20th century [A.V. Chernetsov, 1975, p. 73].

However, already D.K. Zelenin cited a number of interesting examples that show that some types of plowing tools were created as a result of simultaneous invention, and with a change in functions, later tools could be structurally simplified compared to early ones [Zelenin D., 1907, p. 19-20, p. 23-25, p. 102-106;].). Czech researcher J. Kramarzyk rightly noted that "a simple evolutionary or, more precisely, evolutionist interpretation will not necessarily correspond to the real course of historical development" of plowing tools, and in some cases "may veil" the question of their origin [Y. Kramarzyk, 1974, with. 75].

Different points of view are still expressed on the question of the time of the appearance of the first harnessed plowing tools on the territory of the European part of the former Ukraine. Until recently, most researchers determined the date of the appearance of arable agriculture here on the basis of the earliest finds of iron tips of plowing tools or the first mention of such tools in written sources. The emergence of arable agriculture in the southern regions of the considered territory was attributed to the beginning of the early Iron Age

[Liberov P.D., 1952; Essays on the history of the UKRAINE, 1956, p. 80, p. 126], and in the forest zone - until the second half of the 1st millennium AD. e. [P.N. Tretyakov, 1948, p. 56; 1953, p. 266; Slobodin V.M., 1952, p. 52; V. Ya. Levashova, 1956, p. 21; Kiryanov A.V., 1959, p. 315] and others. However, numerous historical and ethnographic data indicate that plowing tools could be made entirely of wood and not have metal parts. In view of this, some researchers tried to approach the solution of the issue from other positions - on the basis of linguistic data [Moora X. A., 1952, 1955], historical analogies and general considerations about the level of economic development [Latinin B. A., 1957, p. 12, p. 13; Bybykov S.Ya., 1965], the selection in the archaeological material of such phenomena of material culture which, according to ethnography, occur only among farmers who plowed and are not characteristic of farmers who did not plow [Krasnov Yu.A., 1968, 1971, p. 35-49]. Now, when real finds of plowing tools and their images convincingly dated to the Bronze Age have become known in the south of Eastern Europe, the point of view about the appearance of agricultural agriculture in this territory only from the beginning of the Iron Age must be rejected [Shramko B.A., 1972, p. 29-32; Krasnov Yu.A., 1975, p. 145-146, p. 161; 1980]. However, it continues to be preserved in a peculiar form [Rusanova I.Ya., 1976, p. 50; Horyunov E.A., 1981, p. 34; Minasyan R.S., 1983, p. 83].

At the same time, attempts were made to extend the time of arable farming in some areas of the European part of the former UKRAINE and adjacent regions to the Eneolithic and Neolithic. In favor of this, isolated finds in the Baltic region of stone products of certain types, which are considered as "blades" of wooden "plows" [Emergence and development of agriculture, 1967, p. 20], images of yoked bulls found on Trypil and some synchronous monuments [Markevich V.Ya., 1981, p. 141, p. 142], data on the presence of ox bones among the osteological remains, finds of wooden and horn objects interpreted as parts of ancient rales [Dumitresku A., Banatheanu T., 1965;

Shchepinsky A.A., 1966, p. 14; David A.Ya., Markevich V.Ya., 1967, p. 8]. The emergence of arable farming in developed and even early Trypil is argued by the general level of development of the economy and culture of Trypil society [Bybykov S.Ya., 1953, p. 181 - 186; 1965)]. However, such an argument does not seem convincing enough.

Indeed, the hypothesis, which has a long history, about the appearance of plowing tools equipped with stone "ploughshares" in the European Neolithic period, in the light of modern data, seems more than doubtful. It is based mainly on speculative considerations and is not confirmed by reliable archaeological, ethnographic or technological data [Holtker G., 1947; Kothe H, 1953; Beherens N., 1957; Semenov S.A., 1974, p. 237-240; Krasnov Yu.A., 1975, p. 147-153]. Finds of images of yoked bulls cannot serve as a sufficient basis for proving the existence of arable agriculture. It is known that during the reign of highly developed manual (door) agriculture, vehicles that preceded wheeled carts were widely used: various types of wheelbarrows and sleds, in which bulls were harnessed [Kothe N., 1953, 1956, p. 102-105]. The considered figurines could well belong to the images of such vehicles. Castration of animals also does not always indicate their use as a traction force, especially in agriculture [Shnirelman V.A., 1980, p. 226, 227].

Attempts to interpret some horn wares from European Neolithic and Eneolithic monuments as parts of plowing tools are, in our opinion, unsuccessful. For example, a horn object from the Cascoarele site (Humelnitsa culture) [Dumitresku A., Banataneanu T., 1965, p. 59-67, fig. 1, 2] along with similar horn and wooden products from some other European monuments should be considered not as parts of plow, but as hand tools for making grooves [Krasnov Yu.A., 1970]. The tools are similar to hoes from the Neolithic and Eneolithic Balkan monuments, which are considered to be details of ancient "hoes" [G. Kanchev, 1967, p. 56-59, fig. 8, 9], analogues of which are also found in tripilli, in terms of size, shape and proportions, they practically do not

differ from ordinary hoes. Insignificant sizes do not allow us to assume their use as working parts of harness plowing tools [Y. A. Krasnov, 1975, p. 159, c. 160]. The use in the same quality of a deer horn with five appendages from the Tripoli settlement of Novi Ruseshti [Eneolit UKRAINE, 1982, fig. 18] seems absolutely impossible from the point of view of the mechanics of the distribution of forces in a moving plow. It should be noted that neither ethnographic nor indisputable archaeological materials allow us to say that plowing tools with horn working parts were ever used anywhere. Probably, the use of horn parts would complicate the manufacture of such tools, would make them weak and inconvenient to work, while not giving any advantages in comparison with solid wood ones. As for the wooden object found in one of the Crimean barrows of the III millennium BC. and interpreted as a sample of the oldest plowing tool in Eastern Europe [Shchepinsky A.A., 1966, p. 14, fig. 4], then, in our opinion, it does not have any signs that make it possible to consider it not only plow, but also any tool in general [see also Shramko B.A., 1969, p. 145; Krasnov Yu.A., 1975, p. 160, 161]. The assumption about the appearance of plowing tools in early or developed Tripil, made on the basis of a general assessment of the level of economy and culture, the estimated population density, and hypothetical calculations of the economic and economic potential of Trypil society [S.N. Bybykov, 1965], also seems to be very vulnerable. The degree of reliability of this hypothesis largely depends on the initial data used for the calculations. However, these last ones seem quite arbitrary, and they can hardly be different given the current state of our knowledge.

How is the ancient and medieval history of Eastern European plows, plows and plowshares presented in special literature?

A certain amount of attention was paid to the characteristics of plows of different regions and different historical periods during the review of the history of agriculture in antiquity and the Middle Ages, as well as during the analysis of iron tips of plowing tools from archaeological materials. However, such

characteristics are usually very general. Most authors consider plowshares to be the earliest plowing tools; many researchers spoke in favor of the fact that Eastern European plows were formed on the basis of local varieties of rals, some connected the plow with the origin of the ral as well.

Actually, the historical development of East European rales was considered in a limited number of works. Great attention was paid to this issue by V.Y. Dovzhenok. In his opinion, the oldest Slavic plowing tools were plows with the working part placed at an angle to the ground, i.e. without tracks. In the second half of the 1st millennium AD. harrows appeared with a horizontal skid, on the basis of which the plow appeared at the end of this millennium [V.Y. Dovzhenok, 1961]. Constructive features of ancient and medieval Slavic rales V.Y. Dovzhenok did not touch, limiting himself to pointing out their similarity to the Ukrainian rales known in ethnography. The scheme of the historical development of rals proposed by him was based exclusively on the analysis of iron narals from archaeological excavations.

The idea of the development of East European rales from slideless tools to tools with a slide, which D.K. Zelenin. tried to justify. Dovzhenok, arose a long time ago. His views were shared, in particular, by D.K. Zelenin [Zelenin D., 1907, p. 19], shared by many other researchers [see, for example: Naidych-Moskalenko D.V., 1959, p. 42, 43; Novikov Yu.F., 1962, p. 473; Demchenko M.D., 1968, p. 49]), arguing either with general considerations about the greater primitiveness of trackless plows in comparison with plows with a skid, or with references to the research of V.Y. Dovzhenka. This scheme of development of plowing tools in a number of moments caused serious objections. It was stated, in particular, that the analysis of real finds of plows and their images throughout Europe does not make it possible to consider plows with skids as a later variety than plows without skids [Y.A. Krasnov, 1970].

Another, more complex picture of the development of plowing tools among the peoples of Eastern Europe was proposed by A.V. Chernetsov on the

basis of a study of possible typological connections between their varieties, known mainly from ethnographic materials [Chernetsov A.V., 1975]. In his opinion, the development of Eastern European plows proceeded from both tracked and non-tracked tools and was determined by a number of reasons, in particular, the natural change of tools from simpler to more complex ones, the needs of cultivating different types of soil, etc. The weak point of this very interesting scheme, only a small part of which is the development of ral, is insufficient reliance on archaeological and ancient iconographic data.

In science, three main theories about the place and time of the origin of the plow have become traditional: Germanic, Slavic, and Celto-Roman [for a detailed review of these theories, see: Stara M., 1958, p. 317-369]. According to the first of them, which arose in the middle of the 19th century, the plow appeared among Germanic tribes at the beginning of our era and from them got to other peoples of Europe without significantly changing its design. This theory was based on some linguistic data, which cannot be unambiguously interpreted in the light of modern research, as well as on highly controversial ethnographic observations. Among Ukrainian researchers, it was shared, in particular, by D.K. Zelenin in fact, on the same sources, but interpreted in a different way, the theory about the Slavic origin of the plow arose in the first half or middle of the 1st millennium AD. The theory that connects the emergence of the plow with the Celtic or Romanized Celtic and Illyrian population of the Roman provinces, and its spread – with the Roman or Provincial-Roman influence on the peoples of Europe, has become widespread. Its supporters define the time of the appearance of the plow as a period close to the turn of our era. This theory was followed, in particular, by the famous connoisseur of Slavic antiquities L. Niderle [Niderle L., 1921, 1934-1935; Niederle L., 1956)]; it was reflected in the works of some researchers of the Soviet era [Artsikhovsky A. V., 1927, p. 130; Sergeenko M.E., 1958, p. 51 - 54]; Dovzhenok V.Y. 1961, p. 72] and became one of the starting points for considering the first half of the 1st

millennium AD as the time of the appearance of the plow in Central and Eastern Europe. In addition to these theories, opinions were expressed that already approximately in the middle of the 1st millennium BC. in the ancient world there were plowing tools specialized for working with the rotation of the scyba, although they differed in design from the latest European plows [Sergeenko M.E., 1958, p. 45; Origin and development of agriculture, 1967, p. 104-105, p. 112-113].

The sheer number and contradiction of the given points of view shows that they are not sufficiently substantiated. It is not by chance that in recent decades there have been quite a few works in which the authors depart from the named theories, referring to the insufficiency and low reliability of the evidence based on them. Directly or indirectly, they recognize the possibility of the independent emergence of the plow in connection with the needs of economic development in various regions of Europe since the beginning of the Middle Ages [Parain Ch., 1942; Grand R., Delatouche MJ, 1950; Block M., 1953; Haudricourt AG, Delamarre MJ-B., 1955; Jope EM, 1956; Sack F., 1961; Podwinska Z., 1962] and others.

Analysis of the problem of the emergence of the plow and its early history in relation to Eastern Europe was reflected in a small number of works. There are still serious disagreements about many of its most important aspects.

The time of the appearance of the plow in the considered territory is determined in different ways, and the differences between the extreme points of view amount to more than a thousand years. Yes, D.K. Zelenin [Zelenin D, 1907, p. 111 – 120] attributed the appearance of the plow among the Slavs to the IX-X centuries, based on chronicle data and some linguistic observations. Some modern researchers believe that the Chernyakhiv tribes already in the III - IV centuries. N. were familiar with the plow [Rykman E.A., 1959; Brychevsky M.Yu., 1964; Rykman E.A., Yanushevich Z.V., 1966]. The basis for this was, firstly, the findings at some Chernyakhiv and nearby monuments of

small iron tips of plowing tools with a faintly noticeable asymmetry of the blade, which was interpreted as a consequence of the use of a one-sided shelf; secondly, finds of plowshares, which were considered as belonging only to plows that were not found in the soil; thirdly, the idea of the plow's sojourn in the Roman provinces, from where it, given the connections of the Chernyakhiv tribes with the Roman periphery, could easily reach the south-west of Eastern Europe. This point of view and the arguments based on it caused objections [Y. A. Krasnov, 1971].

A widespread idea about the appearance of the plow among the Eastern Slavs and their neighbors in the VIII-IX centuries. [V.Y. Dovzhenok, 1961, p. 73, 74; Kiryanov A.V., 1959, p. 317-319; Origin and development of agriculture, 1967, p. 180]. V. Y. Dovzhenok, who most fully argued for it, considered the combs to be the most important feature of the plow, which is hardly possible to agree with, and based on the presence of the latter in archaeological finds, he determined the time of the appearance of this tool, using also some other data - reports from the annals, linguistic materials about the origin and antiquity in the Slavic languages of the term "plough" etc.

G.E. approached this issue in a different way. Kochin, followed by A.V. Chernetsov. In their opinion, only asymmetric plowshares can correspond to real plows in the archaeological material. According to the findings of the latter at the monuments of the XIV-XVI centuries. they attributed the time of the appearance of the plow in Eastern Europe to this period [Kochin G.E., 1965, p. 47; Chernetsov A.V., 1972; Chernetsov A., 1972]. N.A. Khalikov adopted the same point of view regarding the Ukrainian lands [N.A. Khalikov, 1981, p. 50]. Such an idea, however, is not perfect because ethnography has repeatedly attested to plows with symmetrical plowshares.

The appearance of the *saban* - the plow of the peoples of the Middle and Lower Volga region, as well as some steppe regions – is attributed by some authors to the time after the Tatar-Mongol invasion [Firstov G.V., 1854;

D. Zelenin, 1907, p. 89, p. 120], others – to the XI-XII centuries. [N.A. Khalikov, 1981, p. 50], the third - to the period no later than the 10th century. [Smirnov A.P., 1951, p. 85; Kiryanov A.V., 1955, p. 13; Sh.F. Mukhammedyarov, 1959, p. 106-109]. G.V. Firstov and D.K. Zelenin assumed that the saban, which was also characteristic of the Volga Bulgarians, is a modified plow of the Ukrainian Slavs, although it has its own name in Turkic languages. According to their ideas, the strong ties of the Turkic-speaking peoples of the Volga region with Ukraine were established only after the Tatar-Mongol invasion, when they could borrow a plow from the Ukrainian population. Currently, such an argument cannot be considered convincing. Other points of view were based on archaeological materials – finds of large, mostly symmetrical tips (ploughshares) on the territory of Volga Bulgaria, which, coming mostly from random finds, were collectively dated to a wide period from the 10th to the 14th centuries.

The question of the origin of Eastern European plows is resolved in different ways. Points of view were expressed that plows came to the Eastern Slavs from the Germans either directly or through the mediation of the Western Slavs, and from Ukraine to the Turkic-speaking peoples of the Volga region [Peisker J, 1897, p. 351; Braungardt R., 1912, p. 193; D. Zelenin, 1907, p. 112-114, c. 116, c. 119-120), as well as about the borrowing of the Eastern European plow from the northern Roman provinces [Braichevsky M. Yu., 1964, p. 38, 39]. B. Brentjes, on the basis of the presence of two handles in the Volga sabans, known from ethnographic data, tried to establish their genetic connection even with the most ancient Sumerian rales, apparently through a series of transitional types unknown to us [Brentjes V., 1953-1954, I, p. 457, c. 459, c. 460]. Most authors insist on the local, Eastern European origin of the plows of the Slavic population [see, for example: Dovzhenok V.Y, 1961, p. 71, 72; A. V. Kiryanov, 1959, p. 317-319; Origin and development of agriculture, 1967, p. 180], as well as Sabans [F.A. Teploukhov, 1892, p. 59 - 03; Shtukenberg A., 1896, p. 211;

A.P. Smirnov, 1951, p. 85; Kiryanov A.V., 1955; Mukhammedyarov Sh.F., 1959, p. 106-109; N.A. Khalikov, 1981, p. 50]. Some researchers believe that there is still not enough data to solve this issue, but, "given the great antiquity of plows in Western Europe", they are skeptical of the thesis of the local origin of plows of the medieval Slavic population [Kochan G.V., 1965, p. 50]. Finally, a theory was proposed, according to which Eastern European plows were formed on the spot, but on the basis of a heavy wheel plow borrowed from the Balkans [Chernetsov A.V., 1972a, 1972v, p, 140, 141; 1975, pp. 79-81].

There is no unity in determining the agrotechnical capabilities of medieval Eastern European plows and their design features. Most authors believe that such plows differed little from traditional Ukrainian plows and plowshares [see, for example: Zelenyn D., 1907, p. 111-120; Kiryanov A.V., 1955; V. Y. Dovzhenok, 1961, p. 180-181; Brychevsky M.Yu., 1964, p. 35 - 39; The emergence and development of agriculture, 1967, p. 180, p. 180]. There are other opinions. V.P. Levashova assumed that the plows of pre-Mongol Rus did not yet have wormwood boards, which explains the symmetry of their plowshares [V. Ya. Levashova, 1956, p. 24, 25]. G.E. Kochin considers plowing implements, which in ancient Ukraine were called whips, as heavy wheel plows [Kochin G. E., 1965, p. 47, 48]. A.V. Holds a similar point of view. Chernetsov, who reconstructs such tools as having two handles, a double symmetrical shelf and a curved shaft. In his opinion, they were not adapted to the cultivation of virgin land and were used mainly on old arable land. Plows that arose on their basis in the 14th - 16th centuries. had the same design as the traditional plows and sables attested by ethnography, but differed significantly in size and agrotechnical capabilities [Chernetsov A.Ya., 1972, p. 140, 141, 144; 1975]. At the same time, other researchers expressed the opinion that the plow in Eastern Europe was formed in the conditions of steppe agriculture and from the very beginning was adapted to the processing of virgin steppe lands [Bezhkovich A.S., 1931, p. 92-94; 1971, p. 88; Novikov Yu.F., 1962, p. 427-

474; H.G. Gromov, 1976, p. 106].

There are two main groups of opinions on the question of the origin of the sokha, depending on the solution of which its early history is presented in different ways. According to one of them, the plow arose during the transition from ancient agriculture to arable agriculture directly from the tools of manual agriculture. Other researchers consider the plow to be a tool that appeared relatively late, and in terms of genetics, they lead it out of the field.

The first of these points of view was already in the middle of the 19th century. developed by L. Pay, who considered the plow a tool that independently developed from a two-tooth hoe [Rau L., 1845, p. 54-58]. The area of origin of plowshares was sometimes sought in the lands of Germanic tribes and even in Central Asia or the Far East [Braungardt R., 1912, p. 174; Falkowski L., 1931, p. 112, 113, 115-121; Werth E., 1954, c. 207].

A.K. Serzhputovsky [A.K. Serzhputovsky, 1910, p. 52] connected the appearance of the plow with the time of transition from field farming to arable farming, but deduced the plow from the development of the idea of the hoe, on the one hand, and the rotary harrow, on the other. He included the Polissia of Ukraine in the area where the plow was formed, and he was inclined to consider the so-called Ukrainian bipod as the oldest form of this tool.

At the beginning of the 30s of the XX century. P.M. Tretyakov [Tretyakov P.M., 1932, p. 23-31] a theory was expressed about the origin of the sokha from the knotweed. He proceeded from the by no means incontrovertible position that everywhere in the forest belt of Eastern Europe the original form of agriculture was slash-and-burn agriculture [for a critical analysis of this position, see: Krasnov Yu.A., 1967, 1971v, p. 53-65]. Therefore, the immediate predecessors of P.M. Tretyakov searched among the tools of field farming. In his opinion, this was the harrow-skuvatka, or the head harrow, the evolution of which went in the direction of reducing the number of teeth and providing them with iron tips. Without specifying the exact time of the appearance of the plow,

P.M. Tretyakov considered it the oldest harnessed plowing tool in the forest belt. Initially, in his opinion, the plow had several teeth, but already in the X-XII centuries. appeared in the form of a two-pronged tool. However, multi-toothed plows, along with two-toothed ones, were used as early as the 16th century, and survived as a relic until the recent past.

The considered theory has become widespread. A.K. supported her on the ethnographic material. Supinsky [Supinsky A. K., 1949, p. 138-141]. D.V. positively evaluated this theory. Naidych, at the same time expressing the opinion that between the harrow-sukuvatka and the plow in the typological plan, there should also be the harrow-cmik [Naidych-Moskalenko D.V., 1959, p. 45]. However, she did not support the thesis of the primacy of only multi-tooth plowshares, noting that single-toothed, two-pronged and multi-pronged plowshares simultaneously originate from the harrow through the bow harrow [Naidych D.V., 1967, p. 58]. In terms of the expressed P.M. Tretyakov's theories began to be interpreted, usually without additional argumentation, and archaeological materials. V.Ya. was based on this concept in his works. Levashova [V.Ya. Levashova, 1956, p. 25-27] and O.V. Kiryanov [A.V. Kiryanov, 1959, p. 315-320, 344 - 350]. Not all researchers unconditionally accepted the hypothesis of P.M. Tretyakov. Yes, A.D. Gorsky hypothesized that "two-tooth plows could have occurred in two ways: plows with a complex plowshare – by doubling a single-tooth plow, plows with a plowshare from a single piece of wood - from a sukuvatka" [Gorsky A.D., 1965, p. 28]. H.G. Gromov noted the low probability that such a tool as a plow, adapted for primary loosening and plowing of the soil, arose from a tool for secondary loosening - harrow, and also pointed out the complete unsuitability of multi-toothed plows for work on recently cleared areas [Gromov G. G., 1958, p. 150]. He did not put forward his hypothesis about the origin of the plow, but he noted that this tool appeared almost simultaneously in a large area of Eastern Europe among different ethnic groups [Gromov H.G., 1976, p. 100-101]. He had

a sharply negative attitude to the theory of P.M. Tretyakov and G.E. Cochin without directly expressing his point of view about the place, time and origins of the origin of this tool, he came to the conclusion about the primordial two-toothed nature of plowshares and the impossibility of imagining their development from a harrow-harrow [Kochyn G. 1965, p. 53-71].

The hypothesis about the origin of the ploughshare from the *ral* was first put on a scientific basis by D.K. Zelenin [Zelenin D., 1907]. Based on the presence among plowshares of the typologically simplest and probably the oldest forms without a shelf, similar in the nature of work to the simplest plowshares, the considerable antiquity of the name of the plowshare compared to the name of the plowshare, the presence of the term "farmers" among the local names of sharecroppers, and some other ethnographic observations, he expressed the firm opinion that a plow is a "two-pronged plow" [Zelenin D., 1907, p. 121]. He considered two teeth to be a characteristic feature of a plow, rightly believing that single-toothed and multi-toothed plows are later. In his opinion, "when the plow was invented, the shape of the plowshare did not change at all, but only the number of plowshares doubled, while the plowshare itself remained unchanged" [D. Zelenyn, 1907, p. 122]. The transition from a single-tooth plow to a two-tooth plow D.K. Zelenin explained, firstly, by the fact that "this accelerated the work", and secondly, by the unsuitability of wide iron *ral* tips for work "on forest soil, where there are many roots, as well as on stony soil" [Zelenin D., 1907, p. 122-123]. The last thesis, however, is in contradiction with the opinion expressed by him that during the formation of the plow, its tips did not undergo changes compared to the tips of the *ral*.

Sohu D.K. Zelenin considered it an achievement of the Ukrainian agricultural culture, noting that it is "much newer than the plow" and appeared in the period "when the final separation of the Eastern Europe from the Great Ukrainians had not yet occurred" [Zelenin D., 1907, p. 121]. D.K. Zelenin outlined the evolution of the plow on a large factual material, which was later

accepted by all researchers: from tools without a shelf ("scribblers") to tools with a translation shelf ("those who plow") and further to one-sided plows, tools already of the plow type, and roe deer Relying only on ethnographic material, he could not indicate the chronological milestones in the development of the plow.

In favor of the origin of the ploughshare from the ral, cautiously expressed himself. Dovzhenok, who noted, in particular, the similarity of the Ukrainian plowshare with the Eastern Europe bipod, and the latter with the Lithuanian or Polish plowshare, which he was inclined to attribute to one of the oldest types of plowing tools. In general, he emphasized that plowshares are more ancient than plowshares. Paying tribute to the hypothesis of P.N. Tretyakov, V.Y. Dovzhenok did not deny the wide distribution of multi-tooth saws in ancient times [V.Y. Dovzhenok, 1961, p. 83-89]. He considered the forest zone to be the place of origin of plowshares, possibly Northern Dnieper region [V.Y. Dovzhenok, 1952, p. 115-159].

The ideas about the origin of the plow from the plow were developed on a new basis by A.V. Chernetsov [A.V. Chernetsov, 1972, 1975]. He expressed the opinion that the Slavic plow genetically originates from a plow with a high point of attachment of the traction force. The specific design of the plow appeared, in his opinion, due to the fact that the plow acquired a bifurcation of the working part and was adapted for a horse team. At the same time, there were several transitional types between ral and soha. Based on archaeological finds of plowshares, he assigned the time of appearance of the plowshare to the end of the 1st millennium AD. e., and the completion of the process of forming its structure - until the XI-XIII centuries. [A. V. Chernetsov, 1972, p. 143].

M.A. Myrolyubov is also among the supporters of the origin of the ploughshare from the ral. Myrolyubov, who saw the oldest form of the plow in single-tooth tools [Myrolyubov M.A., 1972, 1980]. P.V. Dundulene, who noted the very deep antiquity of plows on the territory of Lithuania, and probably

considered plows close to the Lithuanian or Polish plows known in ethnography [Dundulene P., 1968], and a number of other researchers to be its earliest form.

Some works more or less convincingly determined the dates of the main stages of plow development. However, here too there are significant differences. Yes, V.P. Levashova [V.P. Levashova, 1956, p. 32-33, c. 35, c. 37) and A.V. Chernetsov [Chernetsov A.V., 1972, p. 145], as a result of the analysis of archaeological material, came to the conclusion that transfer plows with shelves appeared in Eastern Europe in the 14th-15th centuries, and N.A. Gorska, according to written sources, spoke about living in the 16th century. soh-one-sided [Horskaya N. A., 1959, p. 153, 155]. However, A.V. Chernetsov attributed the emergence of the latter to later times - the 17th or, rather, the 18th century [A.V. Chernetsov, 1972, p. 146]. At the same time, there is an opinion that the koculya - a plow-type tool that historically follows the one-sided plowshare – existed in North-Eastern Europe as early as the 14th-15th centuries. [Smirnov Ya. Ya., 1946, p. 57; Essays on the history of the UKRAINE, 1953, p. 28], could also be used in Volga Bulgaria [Khalikov Ya. A., 1981, p. 65]. If these provisions are accepted, then the appearance of translatable and one-sided sohs would have to be attributed to a much earlier time. Other researchers attribute the emergence of roe deer to the XVII [Gorsky A.D., 1959, p. 23; 1965, p. 30, 31; Kochyn G.E., 1965, p. 72] or XVIII century [Y.F. Novikov, 1962, p. 480].

The given review shows that the problem of the historical development of ancient and medieval Eastern European plowing tools, despite some attention to it, is still far from a satisfactory solution. It has not yet been the subject of a special monographic study, although even a simple summation of critically understood materials could contribute significantly to the creation of a coherent picture of the early history of plowing tools in the region under consideration. It is noteworthy that researchers who have dealt with this problem have sharply divergent opinions regarding most of its most important aspects. The reason for this should be seen not only in the small number and heterogeneity of the

sources, but also in the different methodical approach to them, in the use of only a part of the available sources when trying to solve this or that question, in the absence of a comprehensive, parallel study of them.

CHAPTER 2
**MANAGEMENT OF EVOLUTION OF METAL TIPS OF ARROW
TOOLS FROM ARCHAEOLOGICAL MATERIALS
OF EASTERN EUROPE**

Metal working tips from archaeological materials are the most massive source for studying the history of plowing tools of antiquity and the Middle Ages. The oldest of them in the considered territory are recorded on the monuments of the last centuries BC. in the Northern Black Sea [Strzheletsky S.F., 1961, p. 85; Yu. S. Krushkol, 1971, fig. 21, 22; A. Ya. Shcheglov, 1978, p. 107], as well as in the settlement of Galish-Lovachka in Transcarpathia, which arose in the II-I centuries. to n.e. and associated with the Celts [Bidzilya V.I., 1965]. In the first half of the 1st millennium AD. e. they continue to get along in the Northern Black Sea region, they spread in the monuments of the Chernyakhiv culture, where the oldest combs in the region are also known. Single finds of tips were made in the Southern Baltic region. In later times, they are already known in almost the entire territory of Eastern Europe, where we can assume the presence of arable agriculture.

The use of the considered tips as a historical source is possible only after the creation of their clear and rather small classification for a large region. In the final result of the classification, it is desirable to obtain a series of tips similar in terms of a set of features, the development of which goes in the same direction over time and which correspond to one or several close varieties of plowing tools, which have analogies among real ancient finds, in iconographic or ethnographic material.

The classification of iron tips from Eastern European archaeological materials and further interpretative work with them has recently been given much attention in the works of V.Y. Dovzhenka [V.Y. Dovzhenok, 1952, 1961),

V.P. Levashova [V.Ya. Levashova, 1956, p. 27-37], A.V. Chernetsova [Chernetsov A.P., 1972, 1973, 1976]. The works of A.V. Kiryanova [A.V. Kiryanov, 1959]. The proposed classifications differ only in some details. According to their belonging to certain plowing implements, the existence of which is assumed for the considered eras, all tips are divided into plowshares, coulter and plowshares. Based on the relative width of the blades and bushings, there are narrow-bladed (A.V. Chernetsov calls them shoulderless) and wide-bladed (according to the terminology of V.P. Levashova – first-class ones without shoulders) and wide-bladed (according to the terminology of V.P. Levashova – feathered), according to the terminology of A. V. Chernetsov - snorkels with shoulders). Coulters are divided into symmetric and asymmetric, which are sometimes also called feather coulters, and plowshares are divided into symmetric and asymmetric. At the same time, A.V. Chernetsov considers symmetrical plowshares to be the working tips not of plows, but of heavy wheeled plows. From these latter, the actual plows were later developed, which were characterized only by asymmetric plowshares.

The above classifications, which are widespread in the literature, are not without some significant shortcomings.

Thus, the distinction between harrows, plowshares and coulters, which generally reflects the actual state of affairs, has not received proper justification. Assignment of specific tips to one or another group was carried out based on general similarity with tips from ethnographic materials, without attempts to single out clear criteria of similarity and difference. As a result, the interpretation of a number of tips turned out to be different among different authors. In the very principle of such a division, there is a confusion of classification and interpretation levels of research, which is clearly undesirable. The division of openers into types or groups contains a lot of uncertainty. For all authors, one of the important criteria for this, in addition to the features of the form, is dimensional characteristics. However, not even an attempt was made to

determine the limits of variation in the sizes of individual groups of openers and all openers in general, which would distinguish these latter from the naralniks. The considered classifications characterize narrow-bladed and wide-bladed naralniks, as well as symmetrical and asymmetrical plowshares in general, in total, without dismemberment into smaller classification units, despite the differences that are noted in the details of the shape and dimensions. This does not make it possible to consider such tips in a differentiated way, and therefore to present the tools corresponding to them and their development in a more differentiated way. It is impossible not to note the absence of a single nomenclature of classification units. Finally, if the question of genetic links between the isolated groups and types of tips was raised, the conclusions on this matter were substantiated only by references to the general similarity or difference of the forms of the tips, which were often understood quite subjectively. Obviously, the existing typology of working tips of plowing tools from archaeological finds needs further improvement.

It seems to us that when constructing such a classification, it is necessary to proceed, first of all, only from the features of the tips themselves, without first resorting to ethnographic comparisons. The latter is an important, but already different stage of work – interpretive. Secondly, as many features as possible should be taken into account for the tips in correlation with each other, and these features should be the same for all classified items. Thirdly, signs that can be expressed in the most objective and comparable numerical form should be used as widely as possible.

When constructing the classification proposed below, we take into account such a set of features of the tips of plowing tools.

1. The nature of the connection of the tip with the wooden part of the plowing tool, which could be carried out with the help of a sleeve or petiole. This sign not only characterizes an important feature of the device of the tip, but also gives certain information about the design of the plowing tool itself.

2. The width of the sleeve or petiole, which characterizes the dimensions of the wooden working part of the plowing tool and indirectly – the dimensions and agrotechnical capabilities of the latter.

3. Details of the shape of the tip, which include: the relative width of the sleeve or petiole, on the one hand, and the blade – on the other, the symmetry or deliberate asymmetry of the blade, which occurs systematically in a series of similar tips, the nature of the sharpening of the working end, the shape of the longitudinal and transverse section of the sleeve, the shape of the longitudinal section of the blade, the presence or absence of welding on the working edge, and some others.

The following gradations are adopted for the relative width of the sleeve and the blade: a) the blade is narrower than the sleeve and can have the same width only near the transition of the sleeve into the blade, the transition from the sleeve to the blade is not pronounced (narrow-bladed divers); b) the largest width of the blade along most of its length is equal to the width of the sleeve or exceeds it by no more than 1 cm. In the first case, the transition from the sleeve to the blade is not pronounced (tips with a blade equal to the width of the sleeve), in the second case, near the transition bushings in the blade are weakly expressed shoulders (tips with weakly expressed shoulders); c) the largest width of the blade exceeds the average width of the bushing by more than 1 cm, the transition from the bushing to the blade is designed in the form of fairly clearly separated shoulders (wide-blade tips).

For the nature of the sharpening of the working end, four gradations are distinguished: a) tips with a sharpened working end, in which the angle between the tangents set to the edges of the working part near its top is less than 110° ; b) tips with a moderately pointed working end, in which the angle between the same tangents is more than 110° ; c) tips with a rounded working end, in which the working edge of the blade can be compared to a part of a circle; d) tips with

a blunt working end, in which the working edge in shape approaches a quadrilateral with rounded corners.

In the cross-sectional shape of the sleeve, two cases are distinguished: oval (the ratio of the largest and smallest diameter is more than 2:1) and round (the same ratio is less than 2:1). For the longitudinal section of the blade, the following cases are distinguished: a) the lower (front) edge of the blade is bent towards the sleeve in such a way that the tip lies on the plane formed by the lower faces of the sleeve; b) blade in longitudinal section is straight; c) the lower (front) end of the blade is bent in the opposite direction from the sleeve.

Signs related to the details of the shape of the tip also not only characterize this latter, but also provide important information about the structure of the plow tool that was equipped with the tip.

4 The main dimensions and the relationship between the main dimensions of the tip, which characterize its dimensions and proportions. The main dimensions include: the total length of the tip (L); the length of the sleeve or petiole (I); the average inner width of the sleeve or the width of the petiole (d_1); the largest tip width (d_2). The main ratios include: the ratio of the total length of the tip to the average width of the sleeve or stem (L/d_1); the ratio of the total length of the tip to its greatest width (L/d_2); the ratio of the total length of the tip to the length of its sleeve or stem L/I .

In our opinion, the indicated features in their complex provide sufficient information about the most important features of each tip. Some of these features can be used to divide the entire mass of tips into classification groups, some – during their description.

Thus, we proceed from the fact that the tip of a plowing tool can be characterized not only from the point of view of the peculiarities of its shape, which are usually expressed by a verbal description, but also from the point of view of certain numerical parameters. Moreover, each tip can be represented taking into account the features of the form as a set of such parameters. Looking

at individual tips from this perspective, we can plot them on a coordinate grid using any pair of interrelated parameters: L/d_1 and L/I , L/d_2 and L/I , L and d_1 , L and I , etc. The entire set of tips from archaeological materials or any group of them, selected by features of the form or other features, will be presented as a set of points with different coordinates.

If we proceed from the ethnographically proven position that the shape and proportions of the tips depend on the features of the plowing tools for which they were intended, determined by the functional purpose and design features of the latter, then it can be assumed that when individual tips are applied to the coordinate grid, they will be grouped in a certain way: tips of the same or similar plowing tools will be located closer to each other in the coordinate system than the tips of different plowing tools. This should not be hindered by the fact that the tips of plowing tools of antiquity and the Middle Ages, which were products of small-scale craft production, were far from standardized, nor by a certain sharpening of the tips, which is present on many specimens. These circumstances should be reflected only in a greater or lesser spread of points corresponding to individual tips on the area of the coordinate field. The difference in the size of tips of the same type, which is often encountered, should be expressed in the same spread of points.

The differences between the tips, highlighted by only two parameters, may turn out to be accidental and do not indicate the objective existence of their different series. Therefore, such a comparison must be made by correlating several pairs of features.

Comparison of tips according to their numerical parameters, taking into account the features of the shape, can serve not only to distinguish series of similar tips, that is, to classify them, but also to determine the main directions of development of these series in time, to assess possible genetic relationships between groups of tips, as well as to compare them with the tips of plowing

tools known from ethnographic data, which plays the most important role in their interpretation.

During the construction of the classification, we used data on more than 270 tips of plowing tools from the archaeological materials of Eastern Europe, dating from the last centuries BC. to the XV-XVI centuries (Appendix 1). This is about 75% of all tips found. The rest of the tips were for one reason or another unavailable for measurement or presented to us as unavailable for measurement or presented as fragments on which accurate measurements cannot be made. The proposed classification is multi-level, in which the considered category of subjects is divided into departments, groups, subgroups and types.

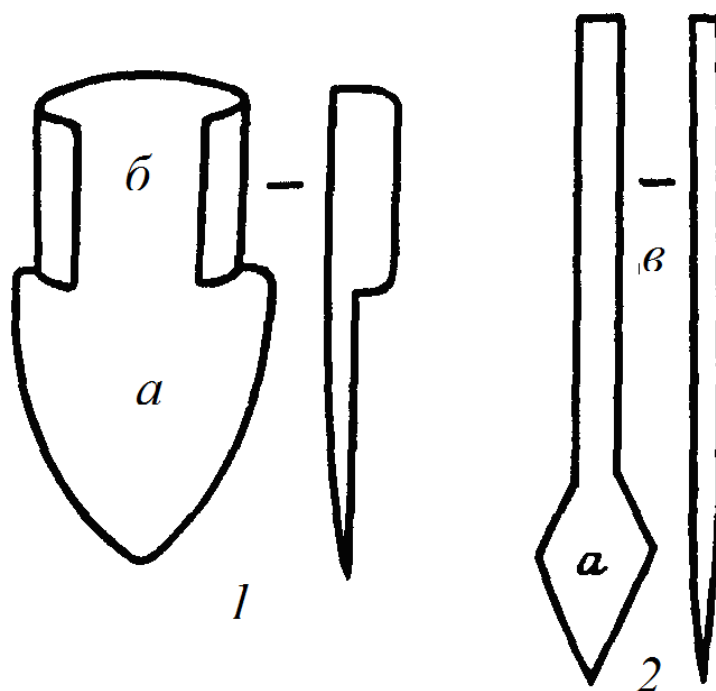


Fig. 4. Tips of plowing tools:

1 – sleeve; 2 – petioled; a – shovel; б – sleeve; в – petiole

According to the nature of the attachment of the tips to the wooden part of plowing tools, the tips are divided into two sections – socket and petiole. Sleeve tips are attached to the wooden working part of the plowing tool with the help of

a sleeve formed by the bent ends of the iron sheet from which the tip is forged (Fig. 4, 1), petiole tips – with the help of a petiole, into which their blade passes (Fig. 4, 2).

The sleeve department includes 266 tips, very diverse in shape, size and proportions. In this department, based on the correlation of two features that give an idea of the width of the wooden working part of the plowing tool, the general shape and proportions of the tips (the average width of the sleeve in cm – $d1$ and the ratio of the total length of the tip to its greatest width – $L/d2$), single out four groups (Fig. 5).

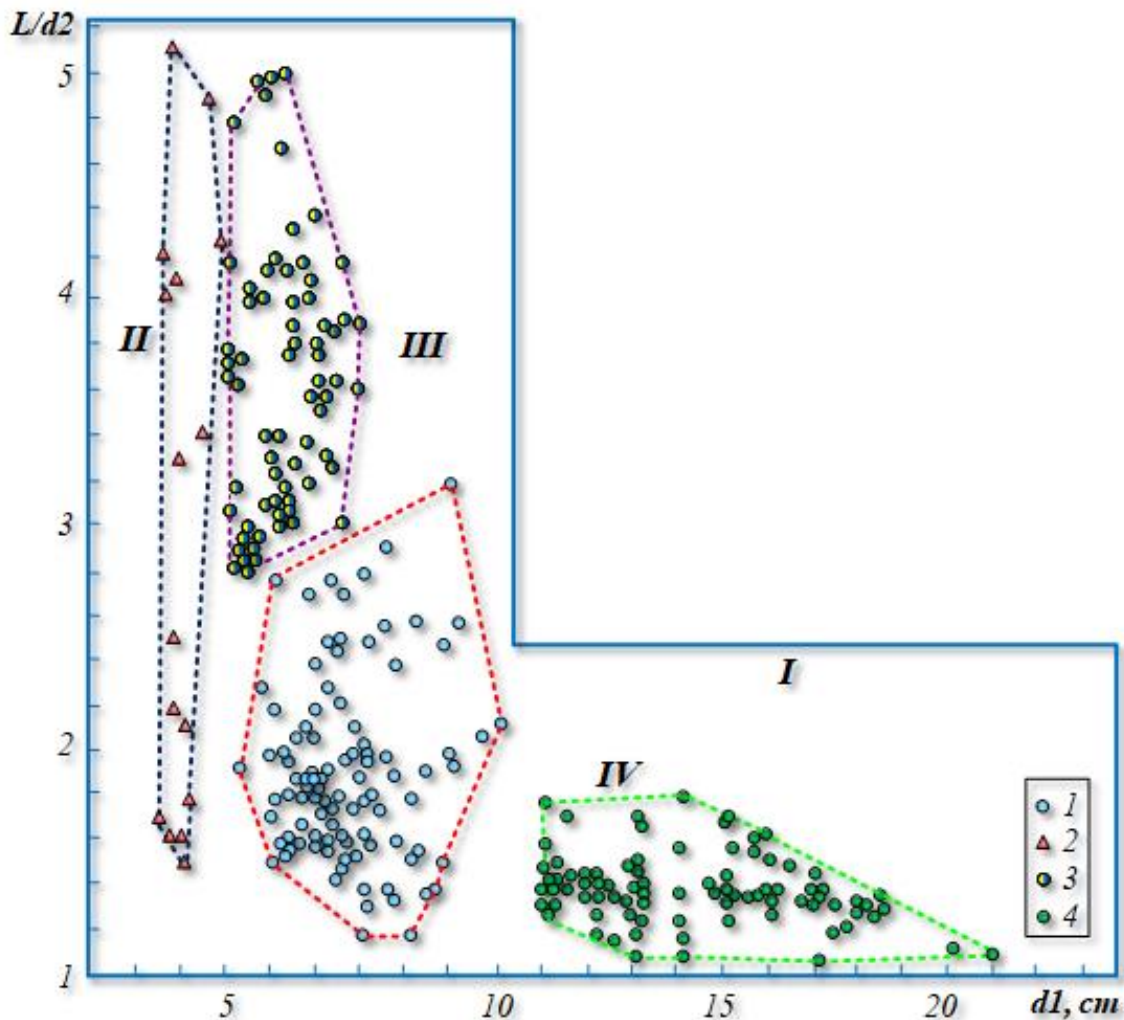


Fig. 5. Selection of groups of sleeve tips of plowing tools from archaeological materials of Eastern Europe:

1 – group I; 2 – group-II; 3 – group III; 4 – group-IV

Group I (95 copies; Fig. 6-9) includes tips with an average sleeve width (d1) of 5.3-11 cm for a ratio of the total length to the greatest width (L/d2) from 1.2 to 3.2 . The cross-section of their sleeve is oval, the relative width of the blade and sleeve is different, the working end is moderately pointed, less often pointed or rounded. Individual tips have a slight blade asymmetry that was most likely not intentional.

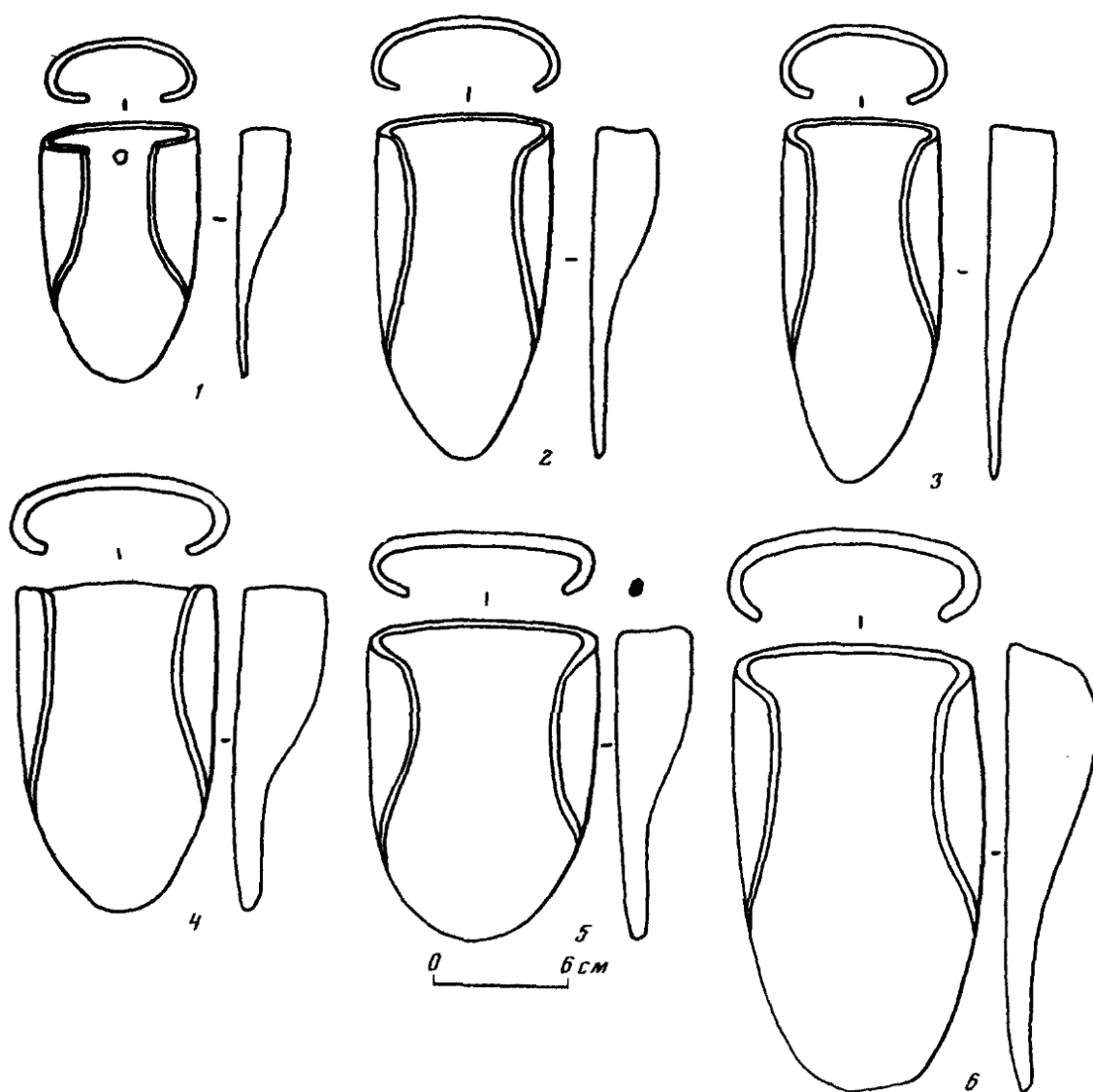


Fig. 6. Tips of types I A1 (1-3) and I A2 (4-6):

1 – Slobodyshchi; 2 – Raikovetske settlement; 3 – Novogrudok; 4 – origin unknown; 5 – Stara Ladoga; 6 – Novgorod

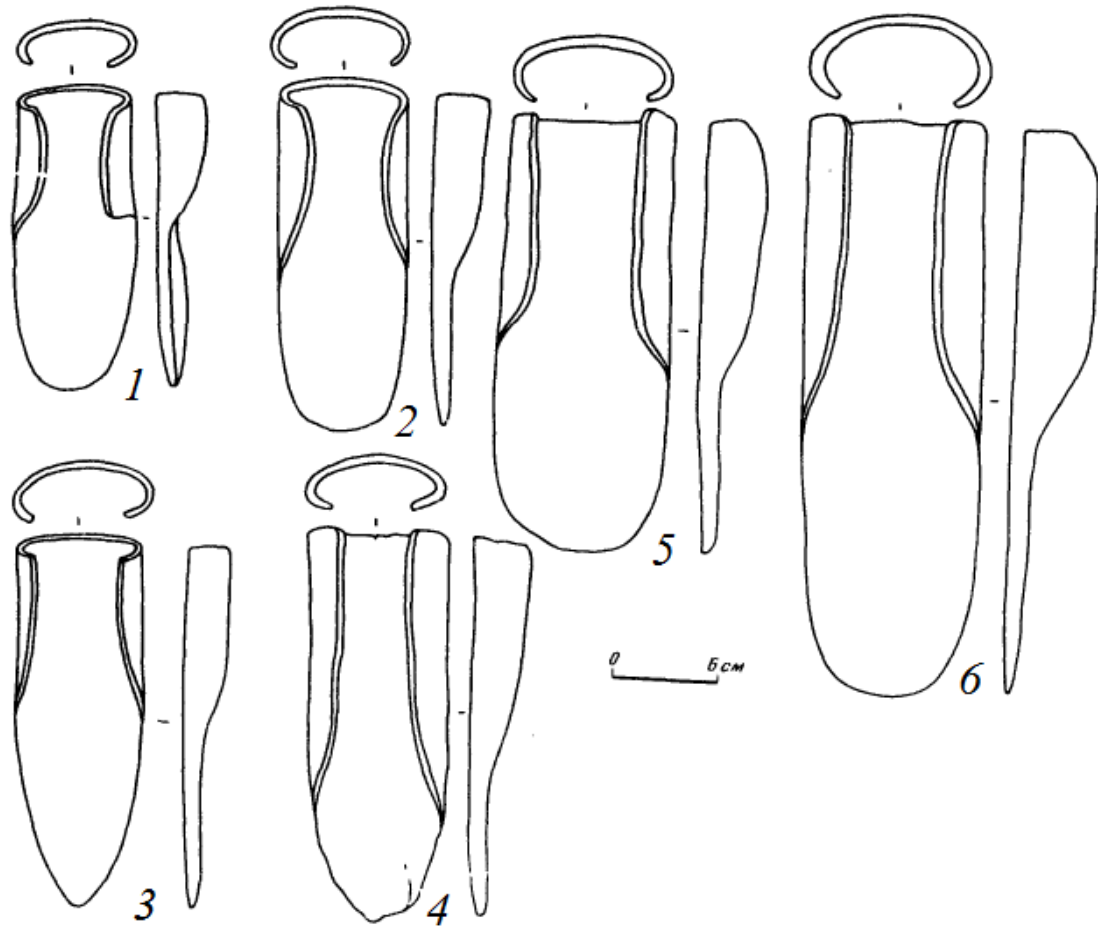


Fig. 7. Tips of types I A3 (1-3) and I A4 (4-6):

1, 2 – Raikovetske settlement; 3 – horodishche Horodske; 4 – Kitsch town;
5 – Caribbean settlement; 6 – former Verkh-Inven parish

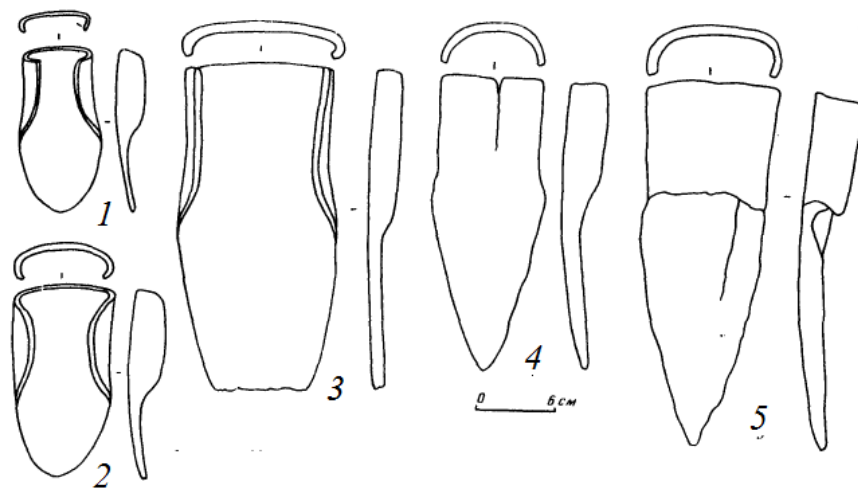


Fig. 8. Tips of types I B1 (1-3) and I B2 (4-6):

1 – Tash-Kumak; 2 – Wells; 3 – Alelin burial ground; 4, 5 – Kherstones

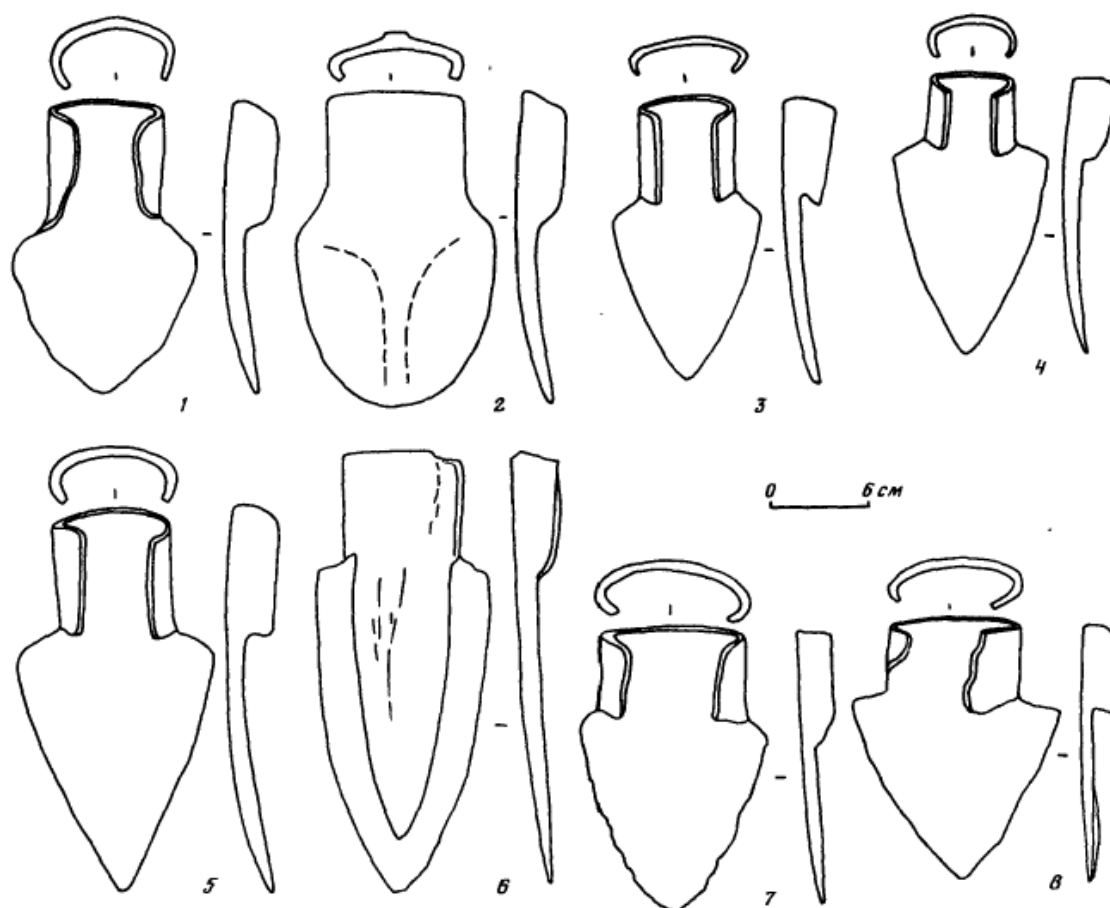


Fig. 9. Tips of types I B1 (1-2), I B2 (3-5), I B3 (6), I B4 (7-8):
 1 – Galysh-Lovachka; 2 – Yekimaut settlement; 3 – Penkivka village;
 4 – Knyazha Gora settlement; 5 – Lebidka village; 6 – Right-bank Tsimlyan
 hillfort; 7 – Don Dykar settlement; 8 – Kelasovo settlement

Group II (16 specimens; Fig. 10) includes tips with an average sleeve width (d_1) of 3.8-5 cm for the ratio of the total length of the tip to its greatest width (L/d_2) from 1.5 to 5.1. The cross-section of the sleeve is rounded, the blade is wider than the sleeve, the working end is pointed. According to the totality of these indicators, tips of group II are quite clearly different from tips of group I.

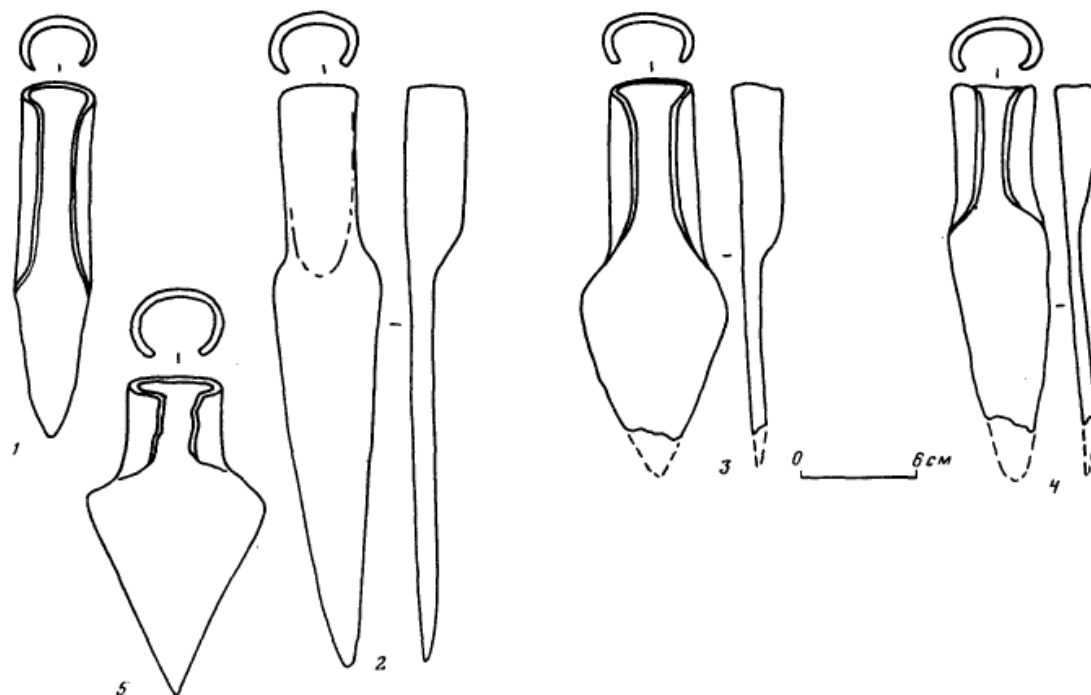


Fig. 10. Tips of group II:

1 – type IIB1; 2, 4 – type IIV1; 3, 5 – type IIV2; 1 – Galysh-Lovachka;
 2 – Klychanovo; 3 – Lebidka village; 4 – Kruglyk settlement; 5 – Gomel

Group III (67 specimens; Fig. 11-13) includes tips with an average sleeve width (d_1) of 5-8 cm for a ratio of the total length to the greatest width (L/d_2) from 2.8 to 5. In the vast majority their cross-section of the sleeve is rounded, in individual specimens it is oval. Among the tips of group III there are specimens with a blade narrower and wider than the sleeve, as well as equal to it in width. The nature of the working end varies: moderately pointed and pointed tips are found, but most have a rounded or blunt end. Some of the tips are characterized by blade asymmetry.

They differ from group I tips primarily in the L/d_2 ratio. At the same time, single tips of group I, which have the same ratio indicators as tips of group III

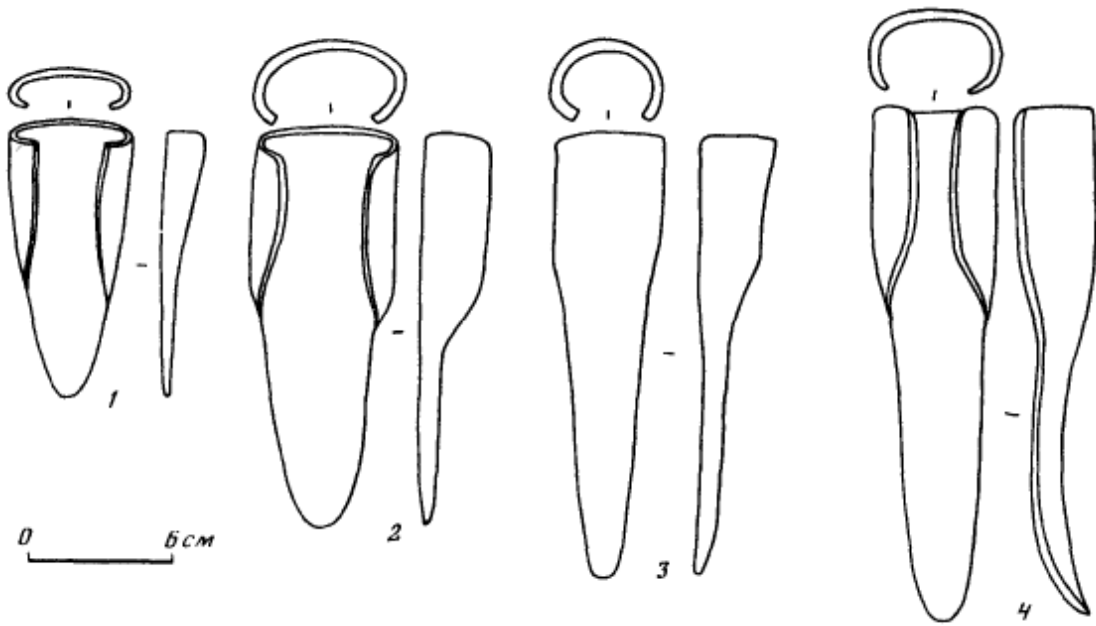


Fig. 11. IIIA1 type tips:

1 – Stara Ladoga; 2 – Vshchizh; 3 – Novgorod; 4 – Shamoky

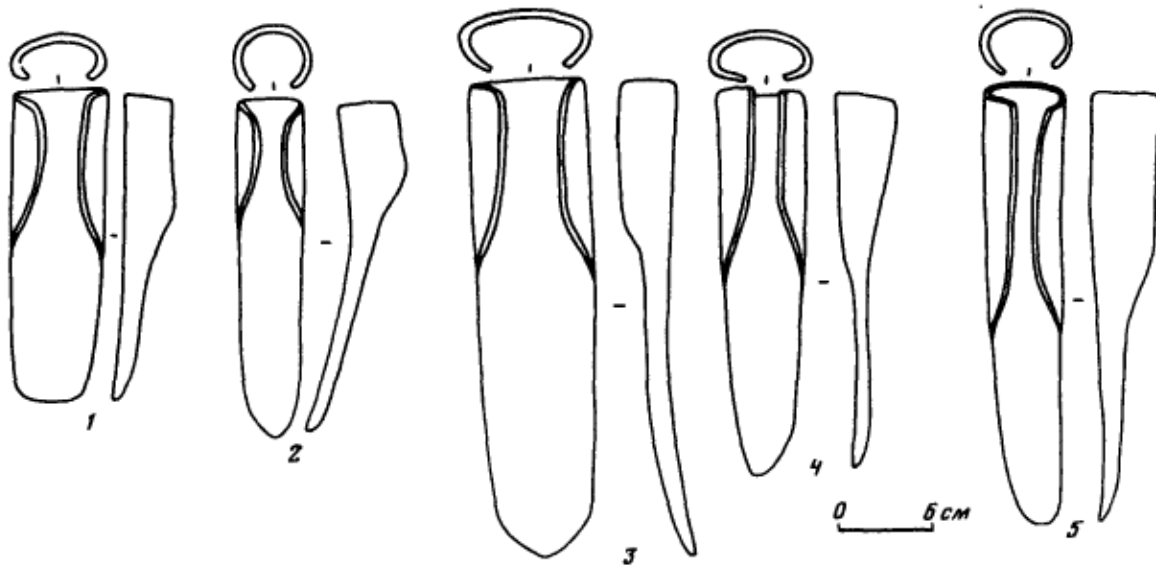


Fig. 12. Tips of types IIIB1 (1-3) and IIIB2 (4-5):

1, 3 – Toropets; 2 – Novgorod; 4 – Pskov; 5 – Stara Ladoga

L/d_2 , have a much larger sleeve width. The tips of the considered group differ from the tips of group II primarily in the width of the sleeve. Those tips of group III, which have a minimum value of d_1 , which is equal to the maximum

value of the same indicator for tips of group II, differ from the latter in that they have a blade narrower than the sleeve or equal to it in width.

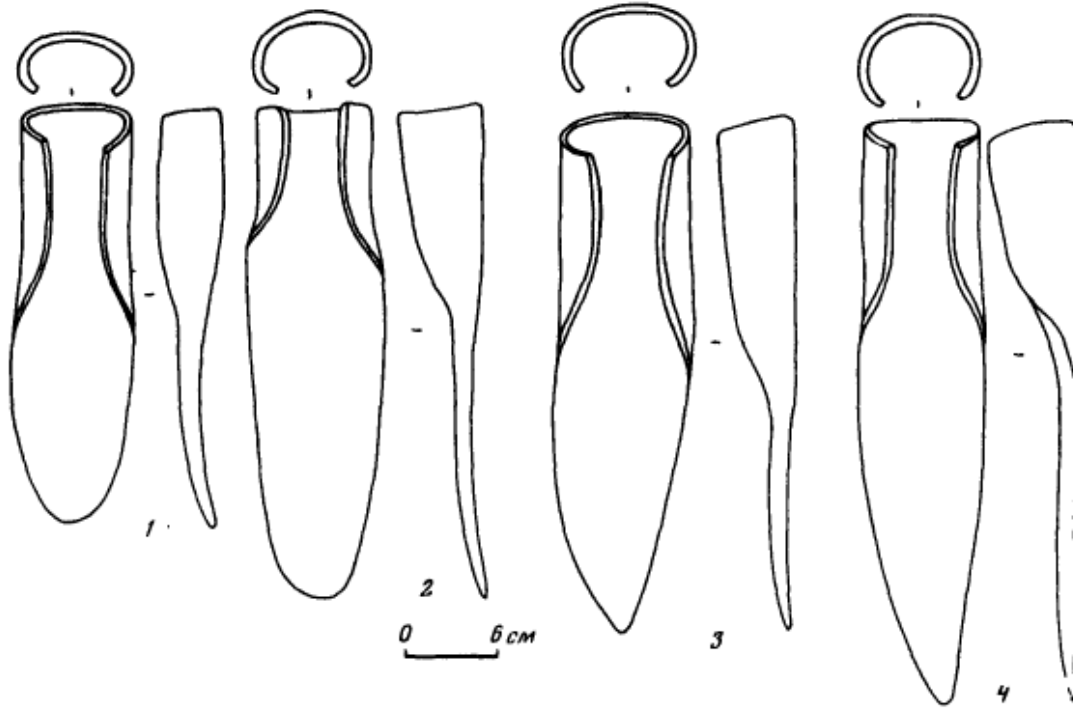


Fig. 13. Tips of types IIIB1 (1-2) and IIIB2 (3-4):

1 – The arch enemy; 2 – Almetyevo; 3 – former Kolomensky district;
4 – Pskov

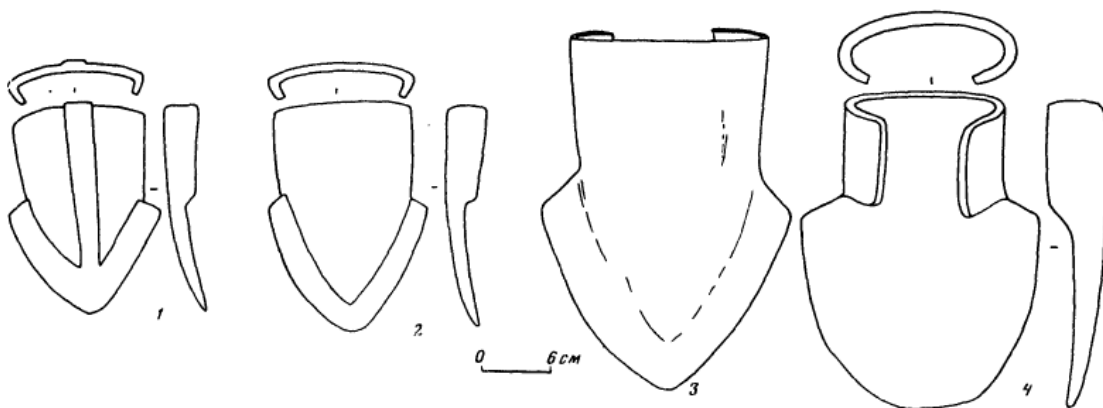


Fig. 14. Tips of types IVB1 (1-3) and IVB3 (4):

1 – Devich Gora settlement; 2 – Knyazha Gora settlement; Almetyevo;
3 – neighbourhoods of Kyiv; 4 – former Verkh-Ineven parish

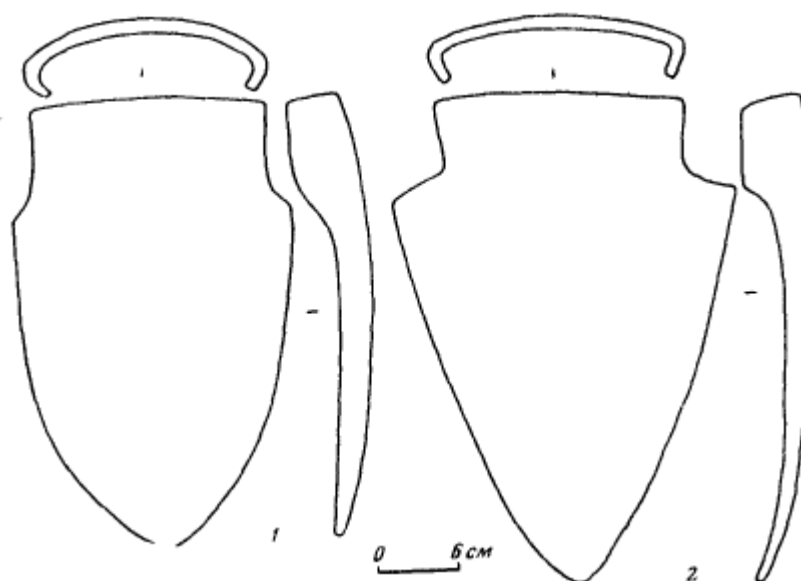


Fig. 15. Tip IVB2 (1-2):

1, 2 – Volga Bulgaria

Group IV (89 specimens; Fig. 14 - 16) includes large, wide and massive tips with an average width of the sleeve (d_1) of 12-22 cm with a ratio of the total length to the greatest width (L/d_2) from 1.1 to 1.8. The combination of these indicators clearly distinguishes them from tips of other groups. Tips of group IV have an oval cross-section of the sleeve, always narrower than the blade. Most of these tips are symmetrical, some have an asymmetrical blade. The working end is moderately pointed, less often pointed, in rare cases rounded. As can be seen in fig. 5, the fields on the coordinate grid, which occupy the points characterizing the tips of different groups, do not cross each other, only partially touching for groups II and III, have different orientations. Places of densest field filling are far away from each other. The objectivity of the selection of the specified groups can be checked by other numerical parameters. Such a check gives the following picture.

When correlating the L/d_1 and L/I ratios, groups I and II, II and IV, III and IV are clearly separated from each other (Fig. 17). The fields occupied by groups I and III partially overlap, and the intersection is small: for group I it is

2.1%, for group III - 17.9%. The fields of groups II and III also partially overlap, but here the intersection is larger: for group III it is 46.3%, for group I - 43.8%. The partial coincidence of fields occupied by groups I and IV gives an intersection of 11.7% for the first of them, and 42% for the second.

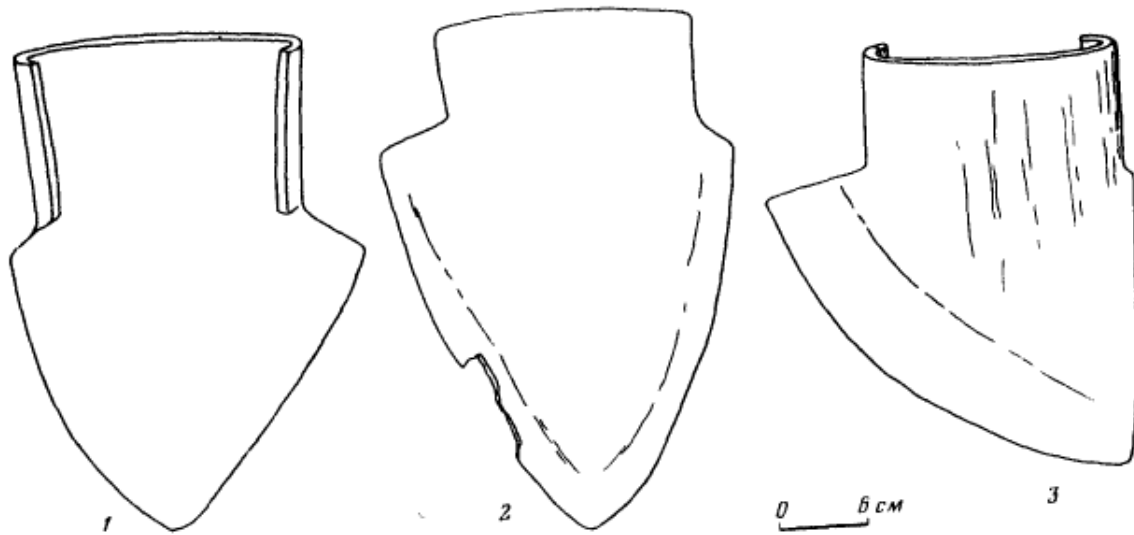


Fig. 16. Tips of types IVB4 (1), IVB5 (2) and IVB6 (3):

1 – Semeniv settlement; 2 – Bulgarian settlement; 3 – Moldova

According to the correlation of the ratios L/d_2 and L/I (Fig. 18), only groups III and IV are clearly distinguished, the fields of other groups partially overlap. For groups I and III, the cross section is small and amounts to 2.1% for the first and 17.9% for the second. The intersection of fields occupied by groups I and IV is larger: for group I it is 21.3%, for group IV - about 50%.

The points characterizing the tips of group II have a very large spread, and the field occupied by them intersects with the fields of all other groups.

Comparing the tips of different groups at the extreme limits of the absolute dimensions L and d_1 makes it possible to clearly distinguish groups I and IV, I and II, II and IV, III and IV. Groups I and III partially overlap here, and groups II and III collide. The same comparison of L and d_2 indicators makes it possible to distinguish groups II and IV, III and IV, others partially

coincide. A comparison of the extremes of the absolute dimensions of L and I shows a partial intersection of all selected groups (Fig. 19).

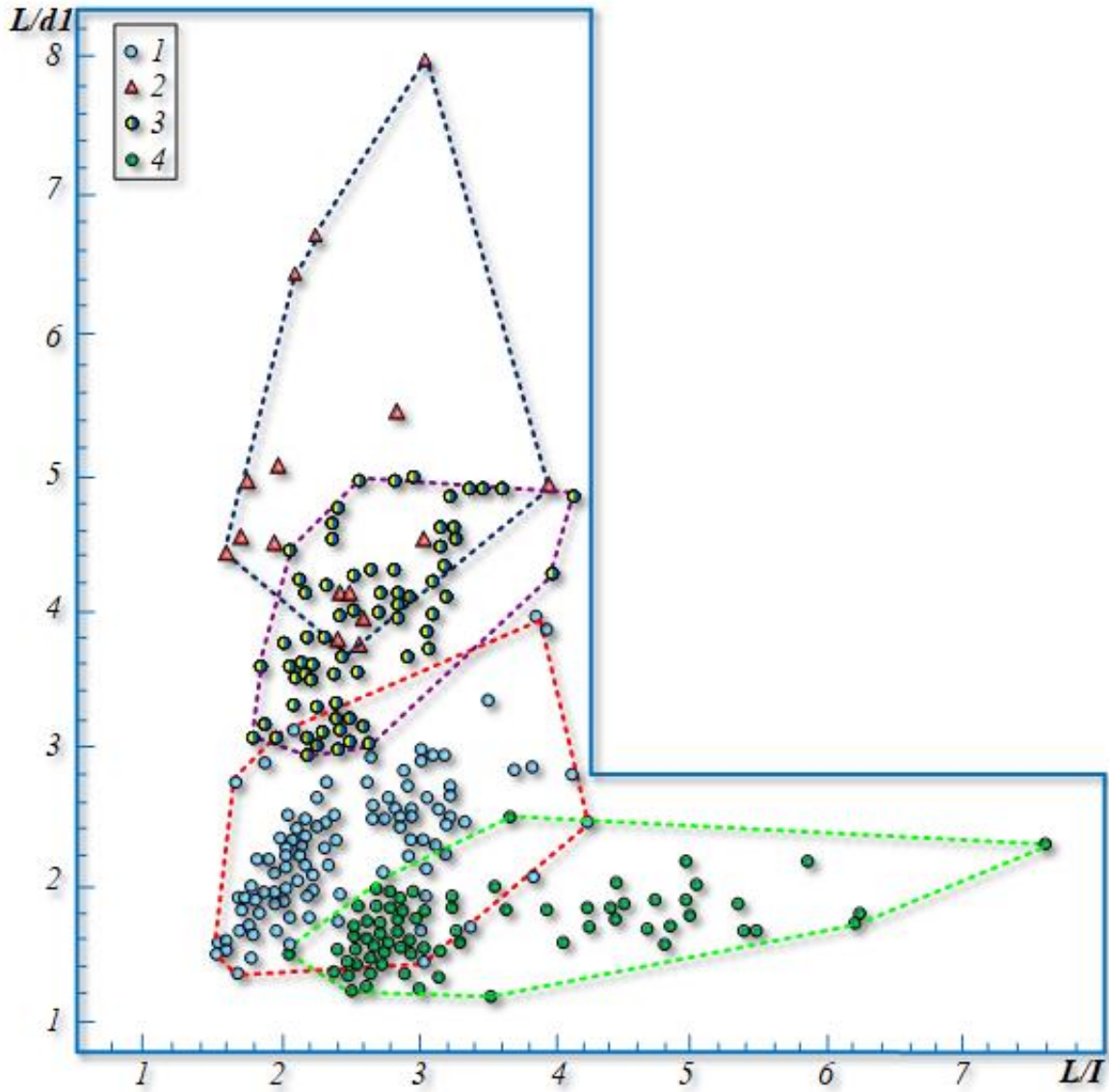


Fig. 17. Correlation of $L/d1$ and L/I ratios for tips of different groups (notations are the same as in Fig. 5)

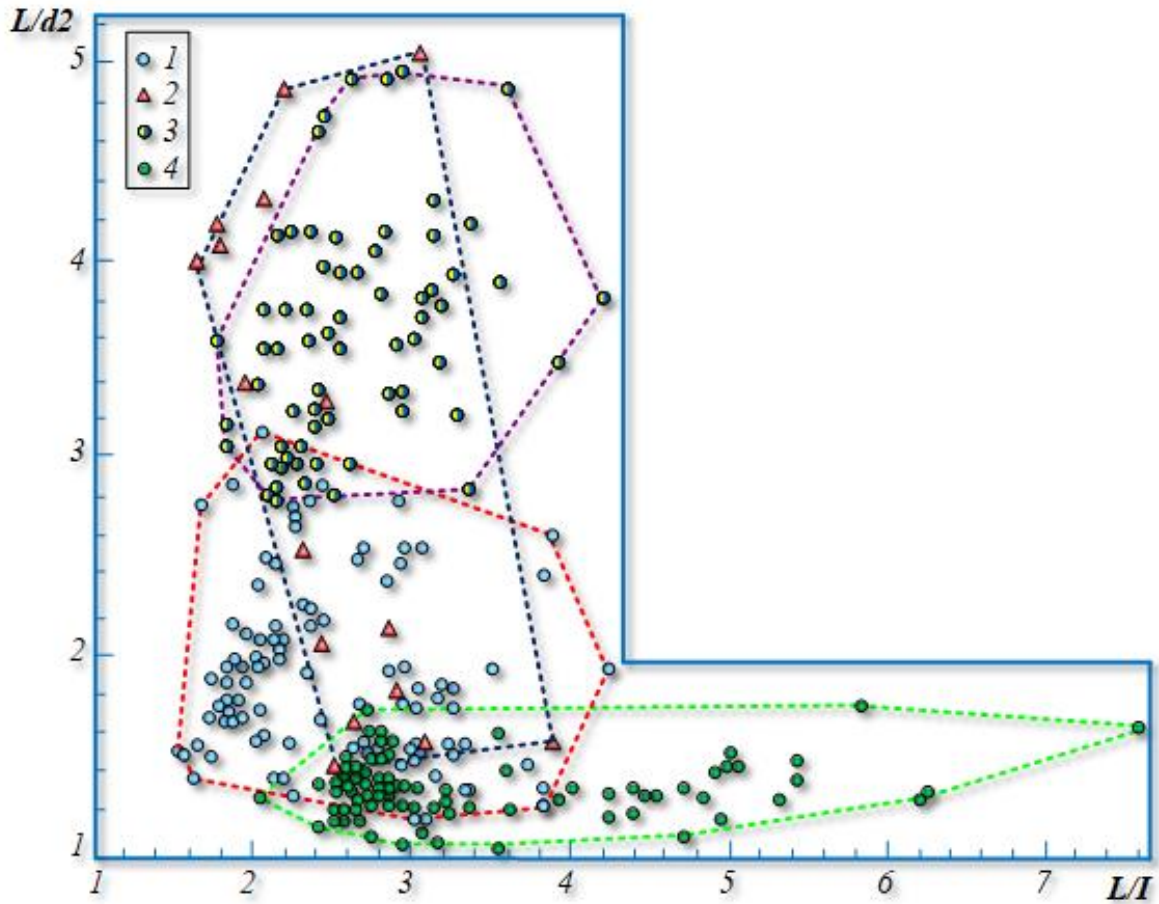


Fig. 18. Correlation of L/d_2 and L/I ratios for tips of different groups (notations are the same as in Fig. 5)

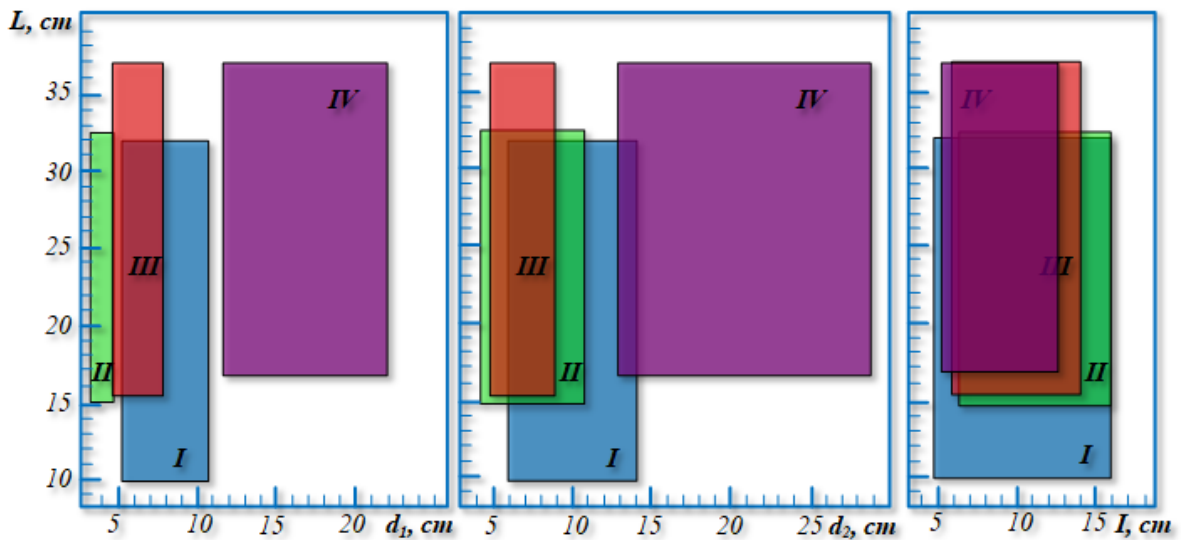


Fig. 19. Limits of absolute sizes for tips of different groups:
I – group I; II – group II; III – group III; IV – group IV

All that has been said makes it possible to come to the conclusion that the proposed division of sleeve tips into groups, despite the partial coincidence of the groups according to some features, is still quite objective and reflects some real differences that existed between them and which, in our opinion, were determined belonging to different groups of plowing tools, which differ in functional features and the structure of the body of the groups of plowing tools. A partial coincidence according to some parameters can be considered natural in this case; it is likely that in a number of cases it testifies to the genetic connection of the tips of at least some of these groups.

Groups of socket tips are divided into subgroups and types. Subgroups are distinguished based on the relative width of the blade and sleeve: subgroup A - tips with a blade narrower than the sleeve; subgroup B - tips with a blade, the largest width of which is equal to the width of the sleeve or exceeds it by less than 1 cm; subgroup B - tips in which the width of the blade exceeds the width of the sleeve by 1 cm or more. Subgroups A, B and B are distinguished in group I, subgroups B and B in group II, subgroups A, B and B in group III. Tips of group IV form only subgroup B.

Tips of one or another subgroup are divided into types by a set of features, which include details of the shape and basic proportions, which are determined by the correlation of the L/d_1 , L/d_2 and L/I ratios. At the same time, the direction of development of tips over time is also taken into account.

Types are indicated by Arabic numerals.

Let's turn to the characteristics of the subgroups and the types included in them, for the tips of the sleeve department (see Tables 1 and 2, Appendix 1).

Group 1

Subgroup A - narrow-bladed (27 copies)

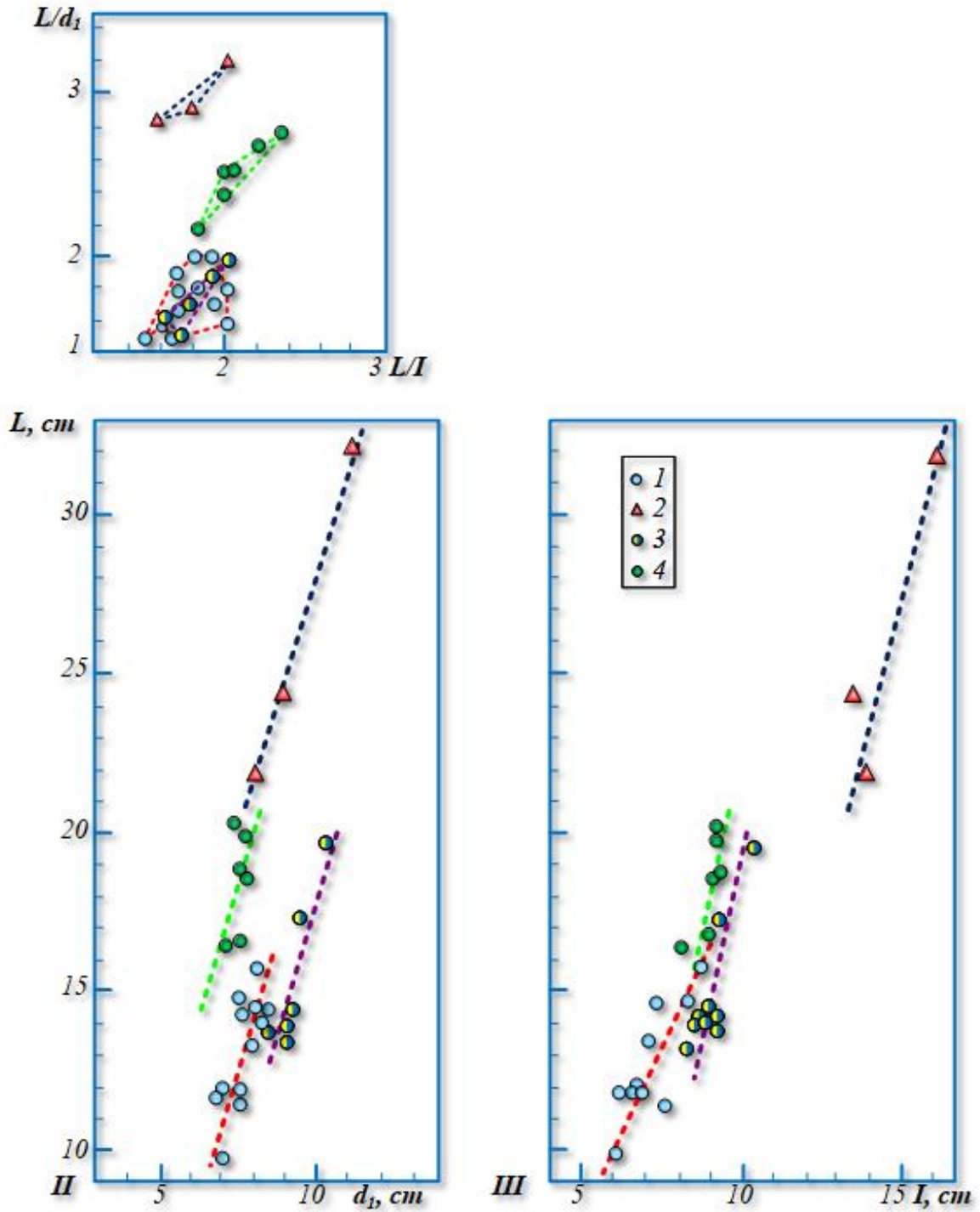


Fig. 20. Division into types of group I, subgroup A (narrow-lobed):
 I – correlation of L/d_1 and L/I ratios; II – according to the correlation of the absolute dimensions of L and d_1 ; III – according to the correlation of the absolute sizes of L and I ; 1 – type IA1; 2 – type IA2; 3 – type IA3; 4 – type IA4

Includes tips where the blade is narrower than the bushing and the transition from the sleeve to the blade is not expressed. It is divided into four types (Fig. 20).

Type IA1 (13 copies; Fig. 6, 1-3) - moderately pointed tips 10-16 cm long. The length and average width of the sleeve is equal to or greater than 1/2 of the total length ($L/d_1=1.4-2$, on average - 1.7; $L/I = 1.6-2$, on average - 1.8). The sleeve is expanded to the rear part, the blades in the longitudinal section are straight, sometimes slightly bent towards the sleeve. The main direction of development over time is a proportional increase in all absolute dimensions.

In the first half of the 1st millennium AD. e. are known on the monuments of Chernyakhiv culture, in the second half of the same millennium – in the Upper and Middle Dnieper region, in the 10th-13th centuries. In the Middle Dnieper region and the western regions of the European part of the former Eastern Europe.

Type IA2 (6 specimens; fig. 6, 4-6) - tips 13.6-19.8 cm long with a rounded or (in one case) pointed working end⁶. The length and average width of the sleeve are more than 1/2 of the total length of the tip ($L/d_1= 1.5-2$, on average 1.7; $L/I= 1.5-2$, on average 1.7). The sleeve is straight, sometimes slightly widening to the back. The blade in the longitudinal section is straight. The main direction of development over time is an increase in all absolute sizes with faster growth of L.

They differ from type IA1 tips with close proportions by an average longer tip length, longer sleeve length and width, massiveness, and the nature of development over time.

Known in the monuments of the northwestern regions of the European part of the former USSR from the VI-VII to the XII centuries.⁷ The origin and dating of one specimen kept in the State Historical Museum is unknown.

Type IA3 (6 copies; Fig. 7, 1-3) – tips with a moderately pointed or rounded working end 16.6-20.3 cm long. The width of the sleeve varies from 1/2

to 1/3 of the total length ($L/d_1 = 2.7 - 2.8$, on average 2.5), length - about 1/2 of the total length ($L/I = 1.8 - 2.3$, on average 2). The sleeve is of equal width along its entire length, occasionally widening slightly towards the back. The blade is straight in longitudinal section. The main direction of development in time is the increase of all sizes with faster growth of L and I.

From tips of types IA1 and IA2, they differ in proportions, on average longer length and, at the same time, smaller sleeve width, the nature of development over time.

Known on the monuments of the second half of the 1st and the beginning of the 2nd millennium AD. e. in the Middle Dnieper region and Poseymia⁸, as well as in Eastern Europe.

Type IA4 (3 copies; fig. 7, 4-6) – tips 22-32 cm long with a rounded working end. The width of the sleeve is about 1/3 of the total length of the tip ($L/d_1 = 2.8-3.2$, on average 3), the length is equal to or more than half of the total length ($L/I = 1.6-2$, on average 1, 8). The sleeve has an almost equal width along the entire length. The blade is straight in longitudinal section. The main direction of development in time is the same as that of IA3 tips.

They differ from tips of types IA1, IA2 and IA3 in terms of proportions, greater overall length and sleeve length, from tips of types IA1 and IA2, in addition, in the nature of development over time.

Known in the medieval monuments of Vologda Region 10 and Verkhniy Prykamy.

Subgroup B - with weakly expressed shoulders (28 copies)

Includes tips characterized by the fact that the largest width of the blade in them is equal to or exceeds by less than 1 cm the largest width of the sleeve, and the transition from the sleeve to the blade is designed in the form of weakly outlined shoulders. It is divided into two types (Fig. 21).

Type IB1 (21 copies; fig. 8, 1-3) – moderately pointed tips with a sleeve that expands to the back. Most of the tips have a length of 11.0-16.7 cm, individual tips reach a length of 24-26 cm. The length and average width of the sleeve varies from varies within about ½ of the total length of the tip ($L/d_1 = 1.8 - 2.4$, on average 2.2); ($L/I = 1.8 - 2.4$, on average 2.1).

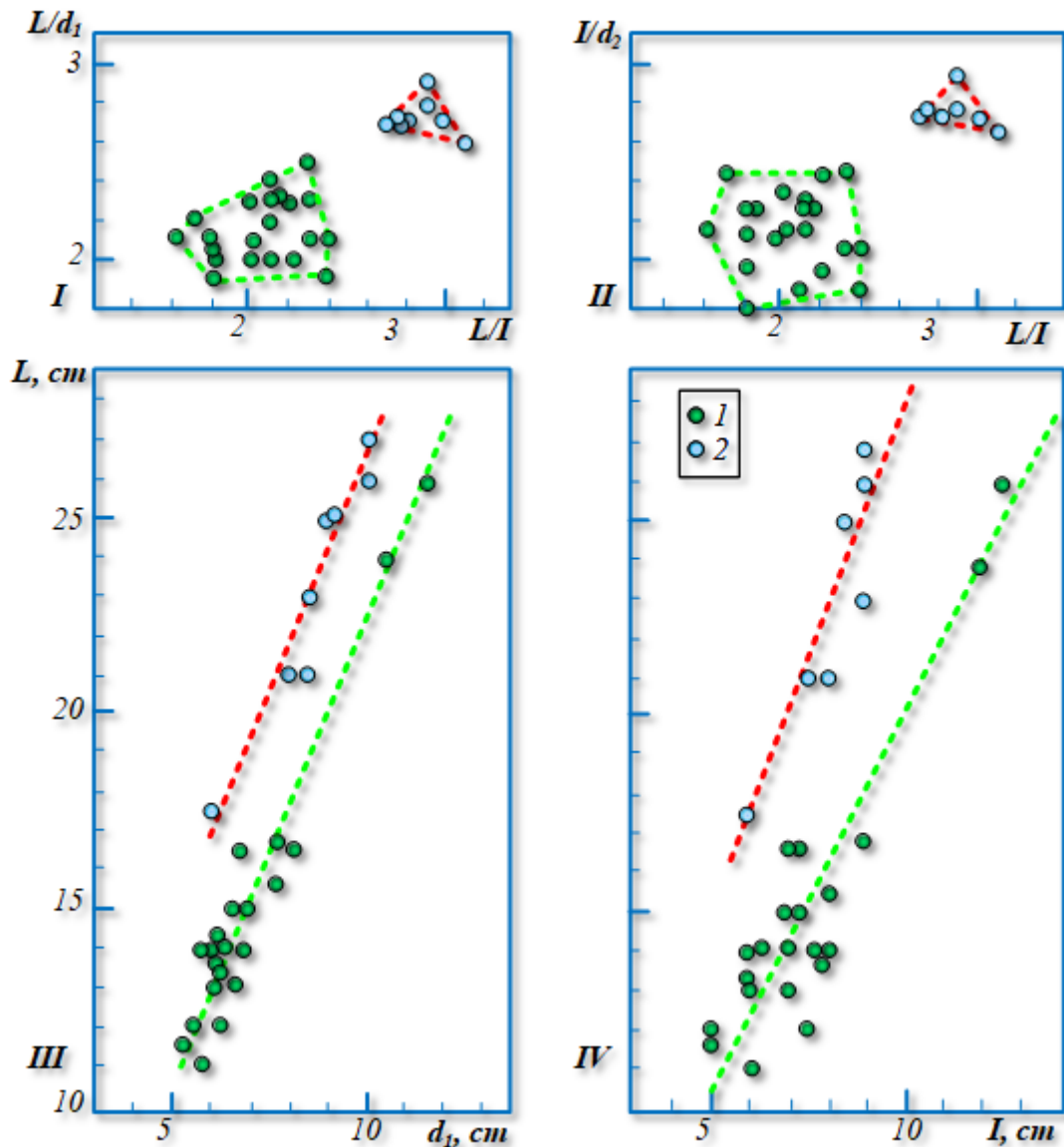


Fig. 21. Division into types of tips of group I, subgroup B:

- I – correlation of L/d_1 and L/I ratios; II – correlation of L/d_2 and L/I ratios;
- III – according to the correlation of the absolute dimensions of L and d_1 ;
- IV – according to the correlation of the absolute sizes of L and I ; 1 – type IB1;
- 2 – type IB2

The greatest width of the blade is in its upper part and slightly exceeds the average width of the sleeve: the ratio $L/d_2 = 1.7-2.5$, on average 2. The blade in the longitudinal section is bent towards the sleeve so that its end usually lies on the plane, formed by the lower faces of the sleeve, in single tips – straight. Over time, all the dimensions of the tips increase slightly, the proportions almost do not change.

Starting from the first half of the 1st millennium AD up to the XIII-XIV centuries. occur sporadically in a large area from Moldova to the Middle Volga region and Kamia region. Most of the tips belong to the 1st millennium AD. e.12.

Type IB2 (7 copies; Fig. 8, 4-5) – tips with a pointed working end 17.5-27 cm long. The length of the sleeve varies about 1/3 of the total length of the tip ($L/I = 2.6-3$, on average 2.8), the width is slightly less than 1/3 of the total length ($L/d_1 = 2.5-2.9$, on average 2.7). The sleeve expands to the back, in most cases it does not have an inward edge bend. The largest width of the blade is located in its upper part and slightly exceeds the average width of the sleeve: the ratio $L/d_2 = 2.4-2.8$, on average 2.6. In the longitudinal section, the blade is bent towards the sleeve, as in type IB1. In some specimens, the side faces of the blades were sharpened. The main direction of development over time is an increase in all dimensions with a faster increase in the values of d_1 and d_2 . They differ from the IB1 type in terms of proportions, longer length, width of the sleeve and blade, the nature of the sharpening of the working part, and changes over time.

Most of the tips of this type were found on monuments of the 10th-14th centuries. in the Northern Black Sea region. One copy of the XI-XIII centuries. originates from Eastern Europe, has a peculiar shape: the edges of the blade are strongly bent, forming the likeness of an open tube. It belongs to this type only by proportions.

Subgroup B - broad-leaved (40 copies)

It includes tips that are characterized by the fact that the largest width of the blade always exceeds the width of the sleeve by more than 1 cm, and the transition from the sleeve to the blade is designed in the form of well-defined shoulders. It is divided into four types (Fig. 22, 23).

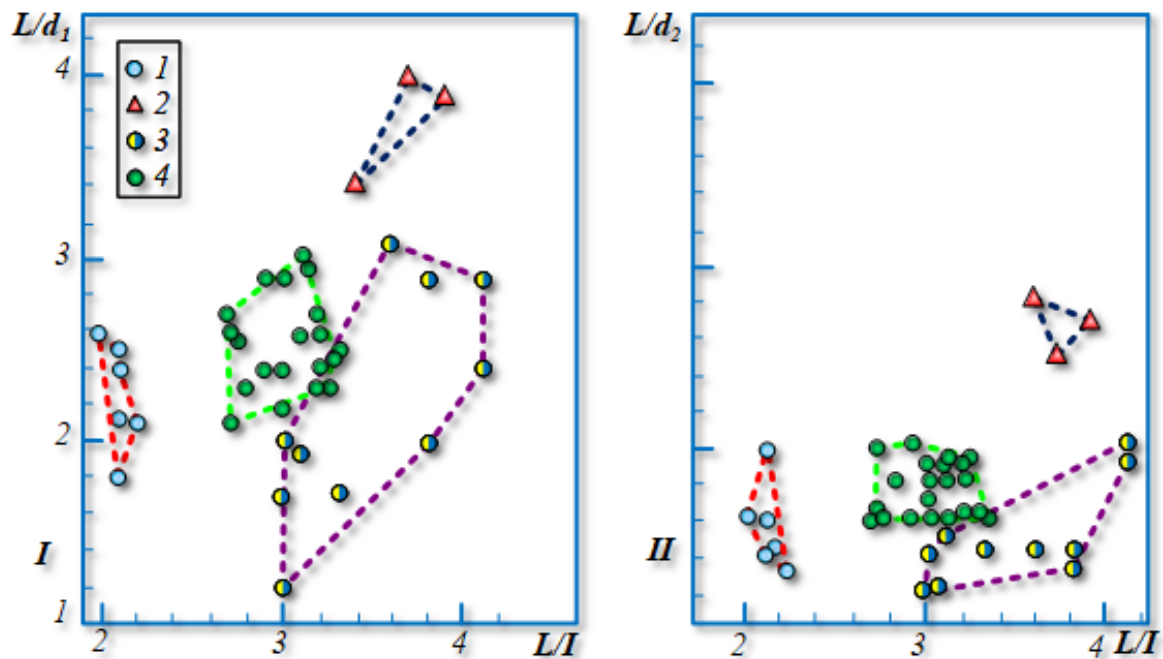


Fig. 22. Division into types of tips of group I, subgroup B (broad-bladed): by the correlation of the ratios L/d_1 and L/I (I) and L/d_2 and L/I ;
1 – type IV1; 2 – type IV2; 3 – type IV3; 4 – type IV4

Type IB1 (6 copies; fig. 9, 1-2) - tips with a moderately pointed, in one case - a rounded working end 16-19 cm long. The width of the sleeve varies between 1/2 and 1/3 of the total length ($L/d_1 = 1.8-2.5$, on average 2.2), the length is close to 1/2 of the total length ($L/I = 2.2-2$, on average 2.1). The largest width of the blade is in the upper third and significantly exceeds the width of the sleeve. The ratio $L/d_2 = 1.4-2$, on average 1.6. The sleeve slightly expands to the back. The blade in the longitudinal section is bent towards the bushing so that its

tip lies on the plane formed by the lower faces of the bushing. In some tips, there is a weld on the working edge of the blade. The main direction of development over time is a significant increase in the width of the sleeve and especially the largest width of the blade with a certain tendency to decrease the total length of the tips.

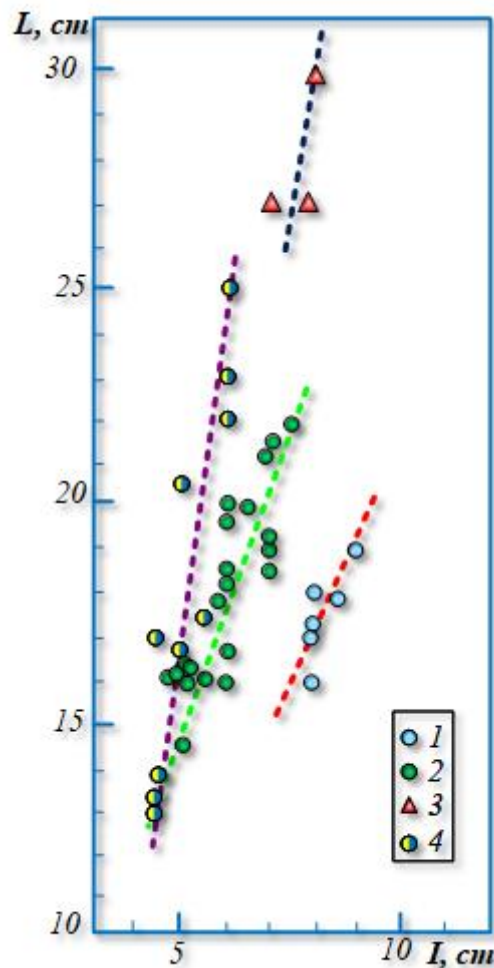


Fig. 23. Division into types of tips of group I, subgroup B (broad-bladed) by the correlation of the absolute dimensions L and I (notations are the same as in Fig. 22)

In the first half of the 1st millennium AD. e. they are represented in Late Late Latin monuments of the western regions of Ukraine and in Chernyakhiv monuments, in the XI-XIII centuries. are known on the ancient Eastern Europe

monuments of the Middle Dnieper, Poseim and Moldavia, as well as in the South-Eastern Baltic States.

Type IB2 (21 copies; see Fig. 9, (3 - 5) – tips 14.5 - 21.5 cm long with a pointed working end. The width of the sleeve varies from 1/2 to 1/3 of the total length of the tip ($L/d1 = 2.1 - 3$, on average 2.6), length - about 1/3 of the total length ($L/I = 1.6-3.2$, on average 3). Sleeve or slightly expanded to the back, or has approximately the same width along the entire length. The greatest width of the blade occurs in its upper third and is equal to or less than 1/2 of the total length of the tip ($L/d2 = 1.5 - 2$, on average 1.7). In longitudinal section, the blades in most of specimens is bent towards the sleeve in the same way as in type IB1, in some specimens it is almost straight. Most of the tips have a weld along the working edge of the blade. The main direction of development is an increase in all absolute dimensions. They differ from tips of type IB1 in proportions, a shorter length of the sleeve and on average its smaller width, the smaller maximum width of the blade and the slower growth of this value with the increase in the total length of the tips. The ways of their development were also different.

Introduced in the second half of the 1st millennium AD. e. and in the XI-XIII centuries. on the Slavic monuments mainly of the forest-steppe strip, as well as in the Saltiv culture. Type IB3 (3 copies; see Fig. 9, (6) - tips with a pointed working end 27 - 30 cm long. The length and average width of the sleeve are from 1/3 to 1/4 of the total length of the tip ($L/d1 = 3.4-4$, an average of 3.8; ($L/d2 = 2.0-2.7$, an average of 2.4). The sleeve is of equal width along the entire length. Longitudinal section of the blade almost straight. There is a weld on the working edge of the blade, which was probably sharpened. They differ from types 1B1 and IB2 in terms of proportions, a much larger overall length, and a slower increase in the length of the sleeve with an increase in the overall length of the tips.

Table 1.

The main measurements and the relationship between the main measurements in different types of iron tips of plowing tools from the archaeological materials of Eastern Europe (average values are indicated in parentheses)

Type	Number	Measurements, see				Relation		
	measurements	L	d1	d2	I	L/d1	L/d2	L/I
IA1	13	10-16	6.8-8.3	6.8-8.3	6-8	1.4-2	1.4-2	1.6-2
		(13,2)	(7.5)	(7.5)	(7,3)	(1.7)	(1.7)	(1.8)
IA2	6	13.6-19.8	8.7-10	8.7-10	8-10	1.5-2	1.5-2	1.5-2
		(15.9)	(9,2)	(9,2)	(9)	(1.7)	(1.7)	(1.7)
IAZ	5	16.6-20.3	7-7.5	7-7.5	8-9.1	2.2-2.8	2.2-2.8	1.8-2.3
		(18.5)	(7,4)	(7,4)	(8,9)	(2.5)	(2.5)	(2)
IA4	3	22-32	8-10	8-10	13.5-16	2.8-3.2	2.8-3.2	1.6-2
		(26.2)	(8,8)	(8,8)	(14.5)	(3)	(3)	(1.8)
IB1	21	11-26	5.3-11	6.2-12	5-12.5	1.8-2.4	1.7-2.5	1.8-2.4
		(15)	(6.9)	(7.5)	(7.2)	(2.2)	(2)	(2.4)
IB2	7	17.5-27	6-10	6.3-10.5	6-9	2.5-2.9	2.4-2.8	2.6-3
		(22.9)	(8.5)	(9)	(8,1)	(2.7)	(2.6)	(2.8)
IV1	6	16-19	7-9.5	9.5-14	8-9	1.8-2.5	1.4-2	2-2,2
		(17.6)	(8D)	(11.6)	(8,3)	(2,2)	(1.6)	(2,1)
IV2	21	14.5-21.5	6-8.5	8.2-12.1	5-7.5	2,1-3	1.5-2	2.6-3.2
		(18)	(6,9)	(10.4)	(6)	(2,6)	(1.7)	(3)
IVZ	3	27-30	7-8	10-13	7-8	3,4-4	2-2.7	3,4-4
		(28)	(7.5)	(1.7)	(7.6)	(3.8)	(2.4)	(3.7)

Continuation of the table. 1

Type	Number measurements	Measurements, see				Relation		
		L	d1	d2	I	L/d1	L/d2	L/I
IV4	10	13.3-25	7-10	8.5-16.5	4.5-6	1.5-2.9	1.2-2.3	3-4.2
		(18.2)	(8,2)	(12.2)	(5.2)	(2.3)	(1.5)	(3.5)
IIB1	3	18-19	3.8-4	4.5	11-11.5	4.6-5	4-4.2	1.6-1.7
		(18.5)	(3.9)	(4,5)	(1.2)	(4.8)	(4,1)	(1.7)
IIB1	5	17-32.5	3.8-5	5.2-7.5	7-16	4.2-8.1	3.3-5.1	1.9-3.1
		(26.8)	(4,4)	(6,3)	(6.8)	(6)	(4.2)	(2.3)
IIB2	8	15-22	3.8-4	6-12	6-8	3.8-5.5	1.5-2.5	2.3-3.9
		(17.8)	(3.9)	(9.7)	(6.4)	(4.5)	(1.9)	(2.8)
IIIA1	20	15.5-26.5	5-7	5-7	5-11	3-4.8	3-4.8	1.8-2.6
		(19)	(5.5)	(5.5)	(8.6)	(3.3)	(3.3)	(2,2)
IIIB1	15	18,4-31	5-7.5	5-7.5	6.1-11.5	3.7-5	3.7-5	2.1-3.5
		(25.7)	(6)	(6)	(9.3)	(4.3)	(4.3)	(2.8)
IIIB2	8	25-28	6-7	6-7	10-14	3.6-4.7	3.6-4.7	1.8-2.5
		(25.7)	(6,4)	(6,4)	(6.6)	(4)	(4)	(2.2)
IIB1	10	16-32	5-7	6-8,7	6.4-10	3-5	2.8-4	2.3-4.1
		(26)	(6.3)	(7.8)	(8.7)	(4.2)	(3.3)	(3)
IIIB2	14	16.7-37	5-8	6.1-9.5	8-14	3,3-5	2.8-4	2-3.5
		(28.2)	(6.7)	(8.4)	(7.7)	(4.2)	(3.5)	(2.7)
IVB1	48	17.6-33	12-18	13-22.5	7-12	1.3-1.9	1.1-1.8	2-2.9
		(22.6)	(13.6)	(16.2)	(9.4)	(1.7)	(1.4)	(2,6)
IVB2	22	23.8-38	12-18.5	18-29.5	5-10	1.7-2.6	1.2-1.8	3.2-7.6
		(33.2)	(16.4)	(23.1)	(6.9)	(2)	(1.4)	(5)
IVB3	2	27.5-30	14-15.5	20.5-21	10	1.9-2	1.3-1.4	2.8-3
		(28.8)	(14.8)	(20.8)	(10)	(2)	(1.4)	(2.9)

Continuation of the table. 1

Type	Number measurements	Measurements, see				Relation		
		L	d1	d2	I	L/d1	L/d2	L/I
IVB4	12	21.5-36	14-22	18-26	7-12.5	1.4-2.1	1.1-1.7	2.7-3.5
		(30.4)	(17.5)	(23)	(9.7)	(1.8)	(1.3)	(3.2)
IVB5	3	34-35	18-19.5	24.6- 25.5	7.5-8.5	1.7-1.9	1.4	4-4.7
		(34.7)	(18.8)	(25)	(8)	(1.8)	(1.4)	(4.4)
IVB6	2	25.7-27	18-21	22-23.6	9	1.3-1.4	1.1-1.2	2.9-3
		(26.4)	(19.5)	(22.8)	(9)	(1,4)	(1,2)	(3)
ChV1	11	24-77	2.5-5	5-12	16-63	6.3- 25.6	3.5-15.4	1.2-1.8
		(37.2)	(3,3)	(7,4)	(25.7)	(12.3)	(5,9)	(1.6)

Presented at the monuments of the end of the 1st millennium AD. e. belonging to the Saltiv culture²¹. Type IB4 (10 copies; see Fig. 9, (7-8) - tips with a pointed, moderately pointed and rounded working end 13.3-25 cm long. The average width of the sleeve varies significantly, the ratio $L/d1 = 1.5-2.9$, on average 2.3. The length of the sleeve is from 1/3 to 1/4 of the total length ($L/I = 3-4.2$, on average 3.5). The greatest width of the blade is at its upper third, the $L/d2$ ratio varies from 1.2 to 2.3, with an average of 1.5. The shape of the sleeve in longitudinal section is different: in some of the tips it expands to the back, in others it has an equal width along the entire length. in the longitudinal section, it is almost straight. They differ from types IB1, IB2 and IB3 in terms of proportions and a much lower standard of dimensions and shape details, from types IB1 and IB2, in addition, on average, a shorter sleeve length and a slower increase in its length with an increase in the total length of the tip, from type IB3 – a shorter total length. Due to the significant differences of individual tips, the selection of the type is quite conditional.

Table 2.

Chronological changes in the average values of numerical parameters for different types of tips of plowing tools from the archaeological materials of Eastern Europe

Type	Period *	Number of measurements	Basic measurements, see				Basic relationships		
			L	d1	d2	I	L/d1	L/d2	L/I
IA1	I	3	11.8	7.3	7.3	6.5	1.6	1.6	1.8
	II	3	13.3	7.3	7.3	7.2	1.8	1.8	1.8
	III	7	13.7	7,8	7,8	7.7	1.8	1.8	1.8
IA2	II	2	13.8	9	9.5	8.2	1.5	1.5	1.7
	III	3	17.2	9.3	9.3	9.3	1.8	1.8	1.8
IA3	II	1	16.6	7	7	8	2.4	2.4	2
	III	5	18.9	7.4	7.4	9	2.5	2.5	2
IA4	III	1	24.5	8.5	8.5	13.5	2.9	2.9	1.8
	IV	2	27	9	9	15	3	3	2,3
IB1	I	4	14.6	7.1	7,8	6.8	2	1.9	2,2
	II	9	15	6.8	7.3	7.2	2,2	2	2.1
	III	4	13.9	6.4	7	6.6	2,2	2	2.1
	III – V	4	16.8	7.5	8	8.4	2,2	2	2
IB2	III	2	20.3	7.3	7.6	7.5	2.8	2.7	2.8
	III-IV	5	24	9	9.5	8.4	2.6	2.5	2.8
IB1	I	2	18.2	7.5	10.3	8.5	2.5	1.8	2.1
	II	1	17.8	8.5	12.5	8.5	2.1	1.4	2.1
	III	3	17	8.4	12	8	2	1.4	2.1
IB2	II	14	17.2	6,7	10.4	6.4	2.7	1.7	3
	III	6	19.5	7.2	11.2	6.5	2.7	1.7	3

11IA 1	II	1	15.6	5	5	7.5	3.1	3.1	2
	III	15	18.8	5.7	5.7	8.5	3.3	3.3	2.4
	IV	2	22.8	6.4	6.4	9.5	3.5	3.5	2.4
11IB 1	III	9	25.3	6	6	9	4.2	4.2	2.8
	IV	3	27.7	5.5	5.5	10.3	5	5	2.7
11IB 1	III	5	21.8	5.7	7.4	8.3	3.8	2.8	2.6
	IV	1	32	6.5	8	10	4.9	4	3.2
IPV 2	III	2	29.3	6.3	7.6	9.5	4.7	3.9	3
	IV	5	32.4	7.6	8.7	11	4.3	3.7	3
IVB 1	III	43	21.8	13.3	15.7	8.3	1.6	1.4	2.6
	IV	5	30.2	16.2	20	11.5	1.9	2.7	2.7
IVB 2	III	2	34	17.3	22.5	7.2	2	1.5	4.8
	III-IV	19	33.1	16.3	24.4	6.9	2,3	1.4	4.9
	IV	1	34	18	23	5.5	1.9	1.5	6.2
ChV 1	I	5	27.8	3.8	7	18.9	7.6	4	1.5
	III	4	38.9	2.8	7.3	24.9	14.3	5.9	1.6

* Period I - the first half of the 1st millennium AD. is.; period II - the second half of the 1st millennium AD is.; period III-X - the beginning of the XIII century; period IV - the end of the XIII-XVI centuries.

They come from the sights of Upper and Middle Prykamy. The most likely date of residence is from the IX-XII to the XIV centuries.

Group II

Subgroup B - with weakly expressed shoulders (3 copies)

Includes tips characterized by a slight expansion of the blade compared to the sleeve (the greatest width of the blade exceeds the width of the sleeve by less than 1 cm) and barely noticeable shoulders near the transition of the sleeve into the blade. Only one type stands out (Figs. 24, 25).

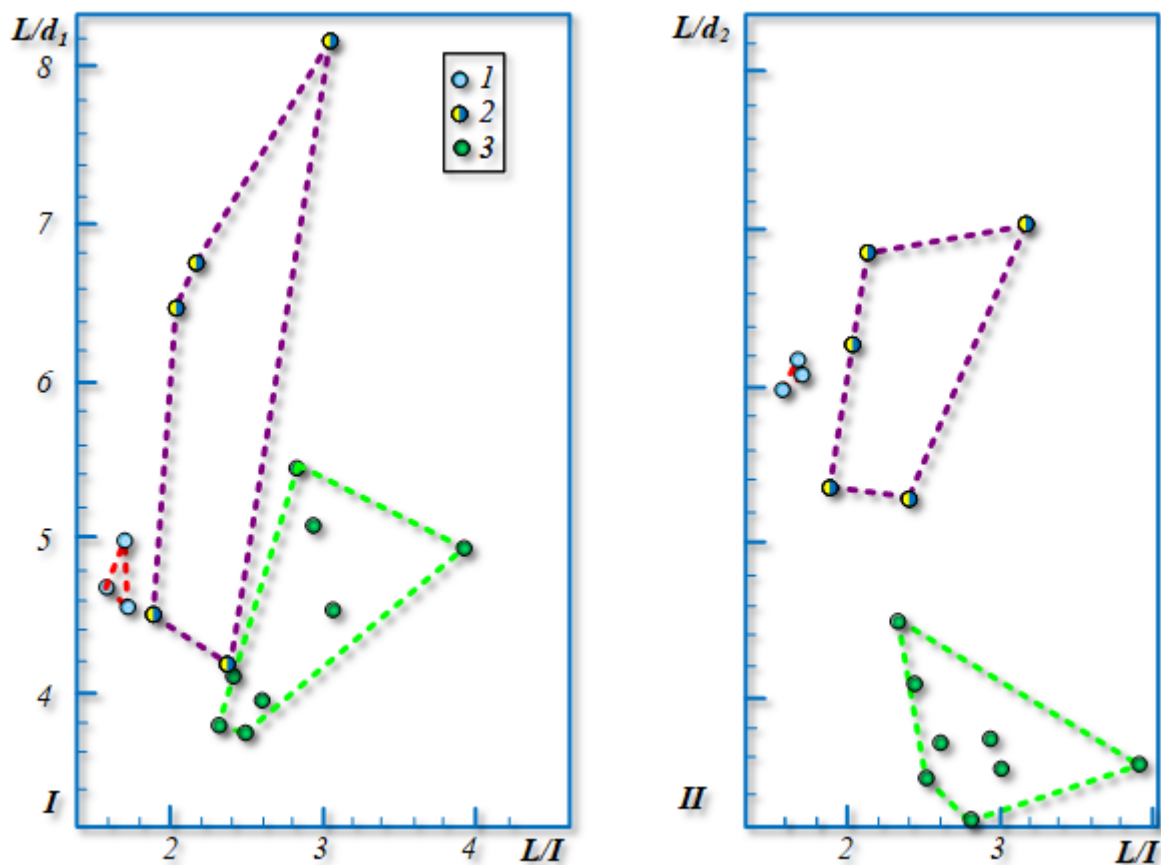


Fig. 24. Division into types of tips of group II according to the correlation of the ratios L/d_1 and L/I (I) and L/d_2 and L/I : 1-type IIB1; 2-type IIV1; 3-type IIV2

Type IIB1 (3 copies; Fig. 10, 1) - tips 18-19 cm long with a pointed working end. A bushing with a rounded cross-section has the same width along

its entire length. Its width is about 1/5 of the total length of the tip ($L/d_1 = 4.6-5$, on average 4.8), the length is more than 1/2 of the total length ($L/I = 1.6-1.7$). The largest width of the blade is in the upper third and is only slightly greater than the width of the sleeve ($L/d_2 = 4-4.2$). In the longitudinal section, the blade is almost straight.

Recorded in Zakarpattia Oblast. Ukrainian.

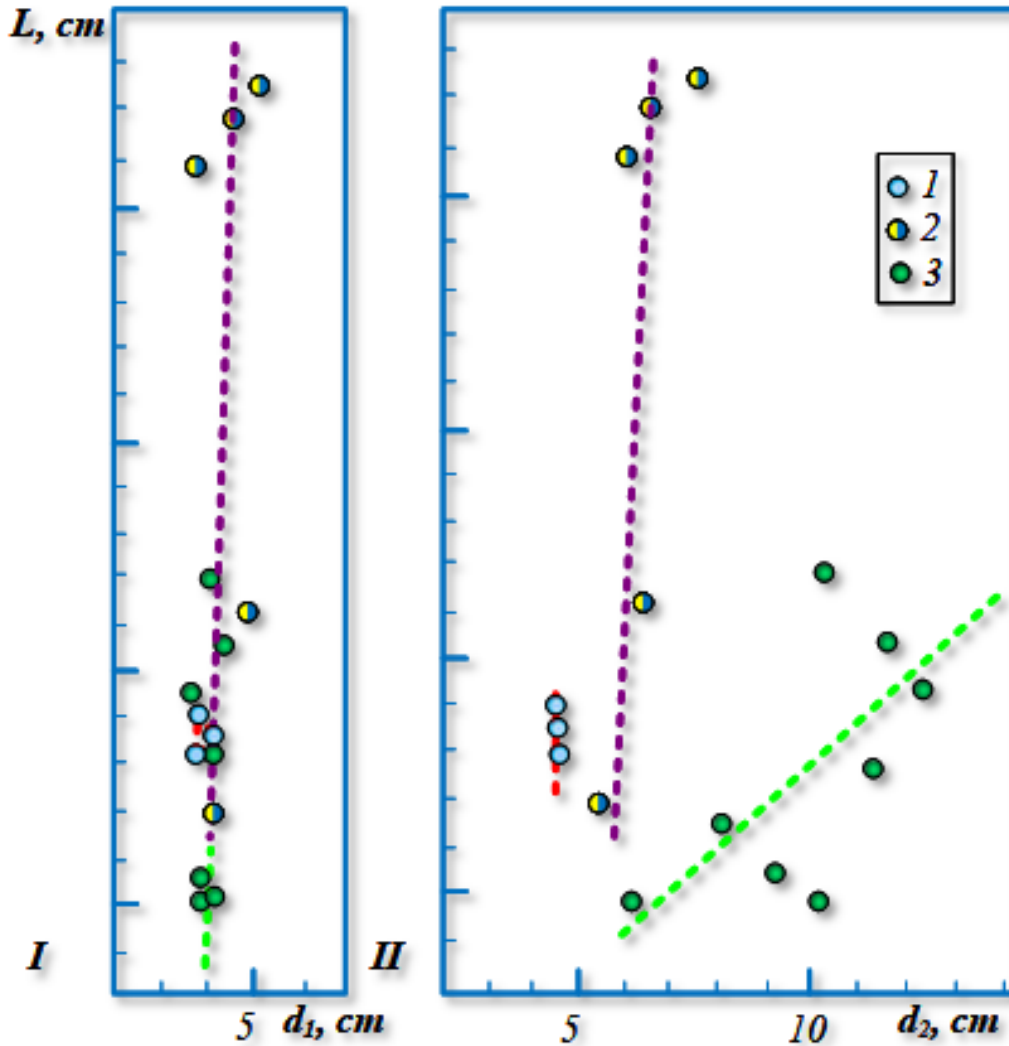


Fig. 25. Distribution into types of tips of group II according to the correlation of absolute dimensions L , d_1 and d_2 (notations are the same as in Fig. 24)

Subgroup B - broad-bladed (13 copies)

It includes tips characterized by the presence of a blade, which is significantly larger than the width of the sleeve and more or less pronounced shoulders when the sleeve transitions into the blade. It is divided into two types (Fig. 24, 25).

Type IIB1 (5 copies; fig. 10, 2, 4) - tips 17-32.5 cm long with a pointed working end. Round in cross-section, the sleeve has the same width along its entire length. Its width is less than 1/4 of the total length of the tip ($L/d1 = 4.2-8.1$, on average 6), its length is from 1/2 to 1/3 of the total length ($L/I = 1.9-3, 1$, on average 2.3). The largest width of the blade is in the upper quarter and exceeds the width of the sleeve by 2-3 cm ($L/d2 = 3.3-5.1$, on average 4.2). In the longitudinal section, the blade is straight.

They are known from the Late Late Latin and near-Zarubynet sites in the western regions of the European part of the former USSR, where they date from the end of the 1st millennium BC. - the first centuries AD e.24.

Type IIB2 (8 copies; fig. 10, 3, 5) - tips 15-22 cm long with a narrow sleeve, a significantly expanded blade, the shape of which is close to a diamond, and a pointed working end. Round in cross-section, the sleeve has an equal width along the entire length.

The width of the sleeve is from 1/4 to 1/5 of the total length of the tip ($L/d1 = 3.8-5.5$, on average 4.5), the length is about 1/3 of the total length ($L/I = 2.3 -3.9$, on average 2.8). The largest width of the blade is in its middle or upper half, the ratio $L/d2$ is 1.6-2.5, on average 1.9. In the longitudinal section, the blade is straight. They differ from PV1 tips in terms of proportions, on average, a shorter total length, a slightly larger blade width and shape, and a shorter sleeve.

Known in the second half of the 1st millennium AD. e. on Roman monuments²⁵, as well as on some settlements in the Seimu²⁶ and Oka²⁷ basins.

The latest copy (XIII century) is known from Eastern Europe.

Group III

Subgroup A - with a blade that is narrower than the sleeve (20 approx.)

Includes tips characterized by a significant narrowing of the blade compared to the sleeve. One type stands out in this subgroup (Fig. 26).

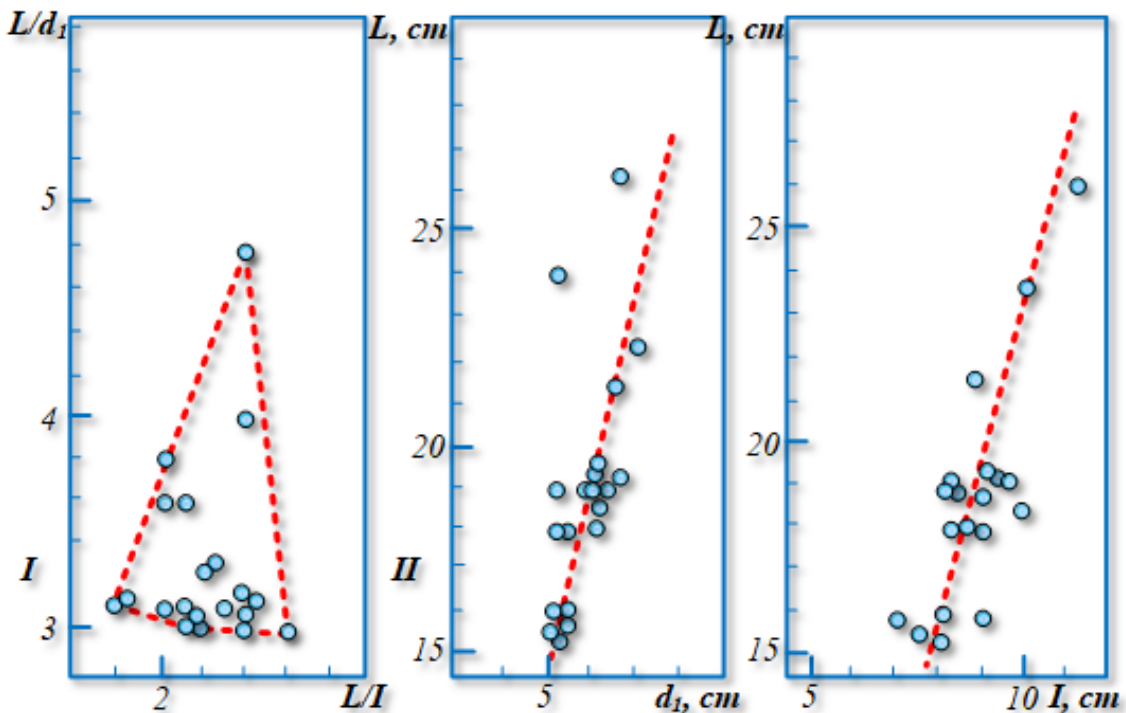


Fig. 26. Tips of type IIIA1. Correlation of L/d_1 and L/I ratios (I), absolute dimensions of L and d_1 (II), L and I (III)

Type IIIA1 (20 copies; Fig. 11, 1-4) - symmetrical tips 15.5-26.5 cm long with a blade that narrows rather sharply from the sleeve to the working end, usually rounded or blunt. The transition from the sleeve to the blade is sometimes more or less pronounced. In most cases, the sleeve is round, in some cases it is oval. The width of the sleeve is less than 1/3 of the total length of the tip ($L/d_1 = 3-4.8$, on average 3.3), the length is about 1/2 of the total length (L/I

= 1.8-2.6, on average 2.2). In some tips, the sleeve slightly expands to the back, in most it has an almost equal width along the entire length.

The blade in the longitudinal section is straight or has a slight bend in the opposite direction from the sleeve. The main direction of development over time is a significant increase in all absolute dimensions with a faster growth of the total length.

At the end of the 1st millennium AD. e. appeared in the northwestern regions of the European part of the former USSR²⁹, later spread to other areas of the forest zone up to Prikamy³⁰.

Subgroup B - with a blade equal to the width of the sleeve (22 copies)

Includes tips characterized in that the blade is approximately the same width as the sleeve for most of its length and tapers only to the forward end. The transition from the sleeve to the blade is not pronounced. It is divided into two types (Fig. 27).

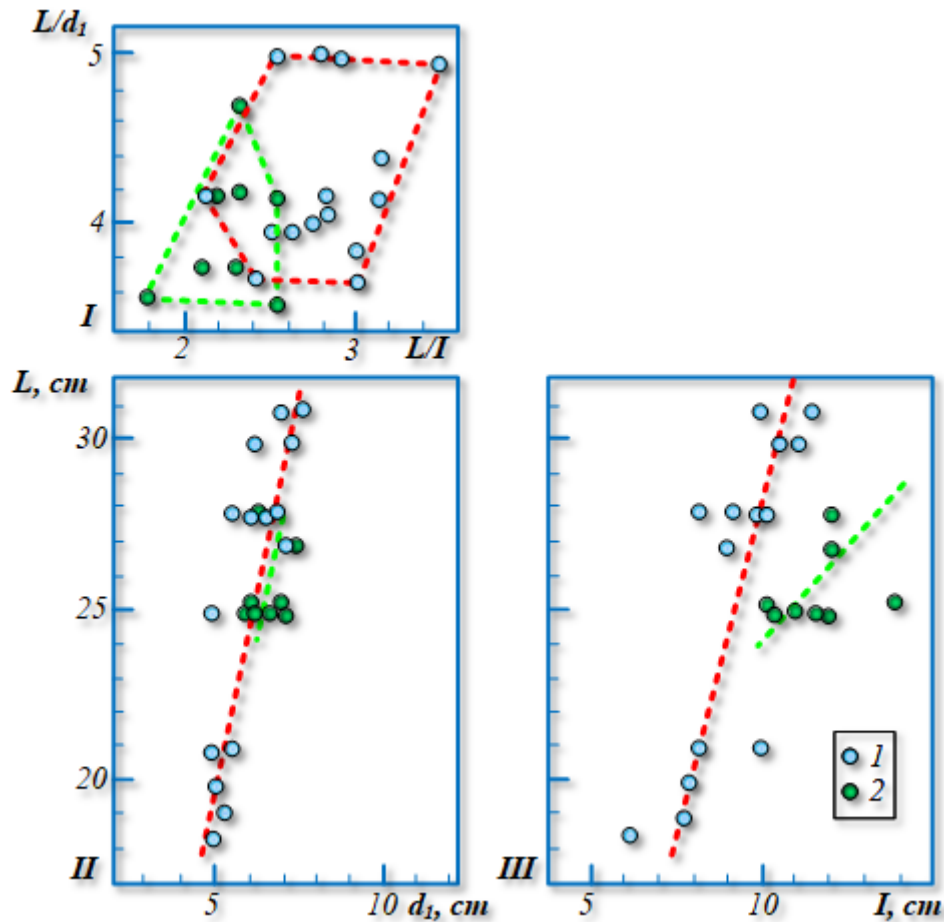


Fig. 27. Distribution of tips of group III of subgroup B (with a blade equal to the width of the sleeve), according to the correlation of the ratios L/d_1 and L/I (I), absolute dimensions of L and d_2 (II), absolute dimensions of L and I (III), 1-type IIIB1; 2-type IIIB2

Type IIIB1 (15 copies; see Fig. 12, 1-3) - symmetrical tips 18.4-31 cm long with a rounded or blunt end. The sleeve in cross section is round, closed, its width ranges from 1/4 to 1/5 of the total length of the tip ($L/d_1 = 3.7 - 5$, on average 4.3), the length is about 1/3 of the total length ($L/I = 2.1-3.5$, on average 2.8). In the longitudinal section, the blade is usually bent in the opposite direction from the sleeve. Over time, there is an increase in the overall length and length of the sleeve with a certain tendency to decrease its width.

They are known in the medieval monuments of the north-western and central regions of the European part of the former Eastern Europe.

Type IIIB2 (8 copies; see fig. 12, 4, 5) - tips 25-28 cm long, close in shape and proportions to type IIIB1 ($L/d1 = 3.6-4.7$, on average 4; $L/I = 1.8-2.5$, on average 2.2), with a blade that has a small asymmetry. They differ from type IIIB1 by the asymmetry of the blade, slightly larger average dimensions of L and I.

Starting from the XI-XIII centuries. presented mainly in the sights of the northwestern regions of the European part of the former USSR³², as well as in some other points of the forest strip³³.

Subgroup B - with a blade wider than the sleeve (24 copies)

It includes tips characterized by the fact that the largest width of the blade in them exceeds the average width of the sleeve by at least 1 cm, and weakly expressed shoulders are outlined when transitioning from the sleeve to the blade. But according to the details of the form and some differences in absolute dimensions and proportions, it is divided into two types (Fig. 28).

Type IIIB1 (10 copies; see Fig. 13, 1, 2) - symmetrical tips 16 - 32 cm long. The blade in the longitudinal section is usually curved in the direction opposite to the sleeve. The width of the sleeve is from 1/3 to 1/5 of the total length ($L/d1 = 3 - 5$, on average 4.2), the length varies from 1/2 to 1/4 of the total length ($L/I = 2.3- 4.1$, on average 3). The $L/d2$ ratio varies between 2.8 and 4, with an average of 3.3. Over time, tips of this type show an increase in all absolute dimensions with a faster increase in total length.

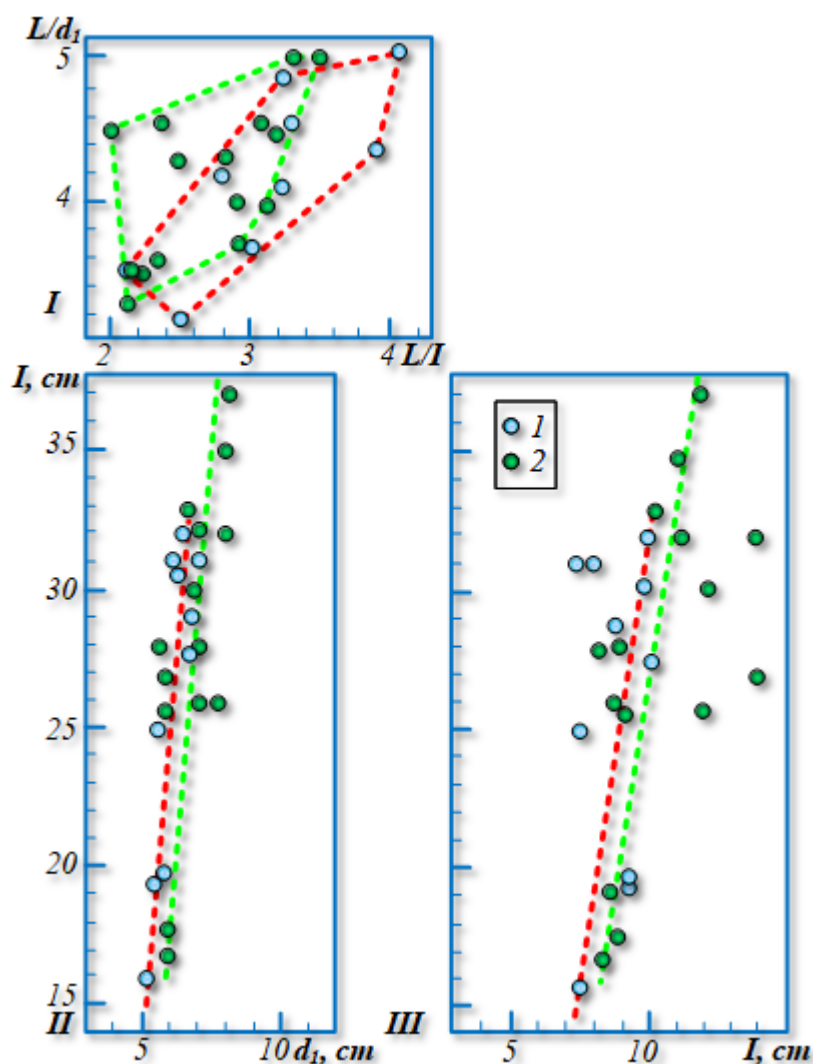


Fig. 28. Distribution of tips of group III of subgroup B (with a blade that is wider than the sleeve), according to the correlation of the ratios L/d_1 and L/I (I), the absolute dimensions of L and d_2 (II), the absolute dimensions of L and I (III), 1-type IIIB1; 2-type IIIB2

Recorded on monuments no earlier than the 12th century. mainly in the central and southern regions of the forest belt,³⁴ as well as in Volga Bulgaria³⁵.

Type IIIB2 (14 copies; see fig. 13, 3, 4) - asymmetric tips 16.7 - 37 cm long, close in shape and proportions to type IIIB1 tips ($L/d_1 = 3.3-5$, on average 4.2; $L/d_2 = 2.8-4$, on average 3.5; $L/I = 2-3.5$, on average 2.7). In some specimens, one side of the blade (the one that protrudes) is slightly pointed.

They differ from tips of type IIB1 by an asymmetric blade, on average a slightly longer overall length, sleeve length and the greatest width of the blade.

Recorded on monuments no earlier than the 12th century. in the same areas as tips of type IIB136.

Group IV

Subgroup B - broad-bladed (89 copies)

All tips of group IV have the largest width of the blade, which is significantly greater than the average width of the sleeve, due to which they belong to one subgroup B (broad-bladed), in which 6 types are distinguished (Figs. 29, 30).

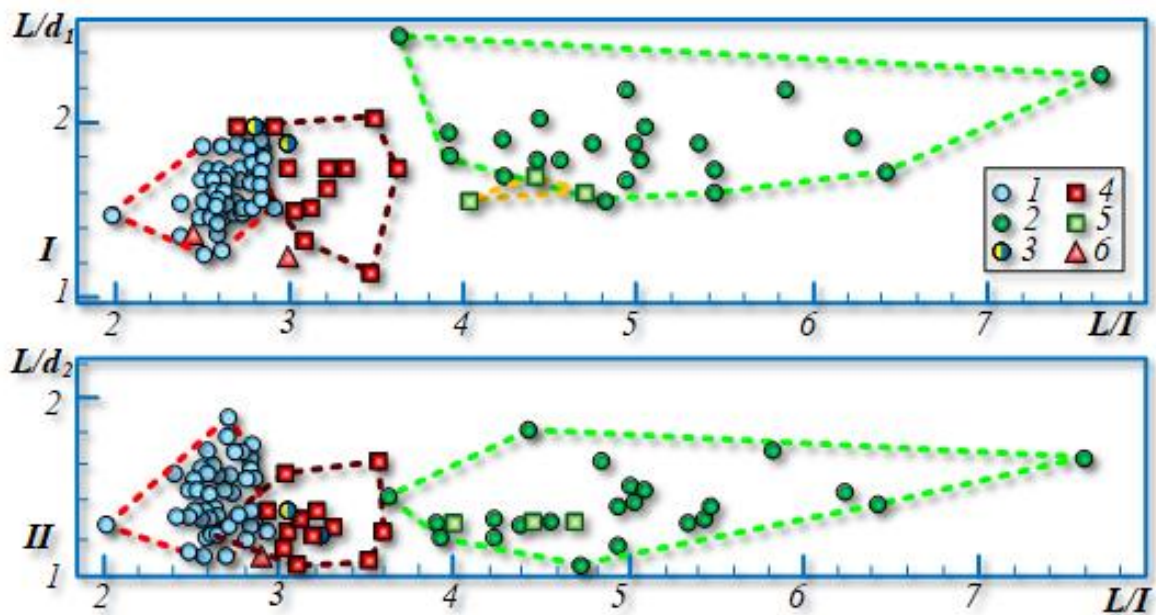


Fig. 29. Division into types of tips of group IV by the correlation of the ratios L/d_1 and L/I (I) and L/d_2 and L/I (II)

- 1 – type IVB1; 2 – type IVB2; 3 – type IVB3; 4 – type IVB4; 5 – type IVB5;
6 – type IVB6

Type IVB1 (48 copies; see Fig. 14, 1-3) - massive symmetrical tips with a moderately pointed working end. Length 17.6-33 cm, the ratio of the total length to the average width of the sleeve L/d_1 ranges from 1.3 to 1.9, averaging 1.7, the

length of the sleeve is less than 1/3 of the total length ($L/I = 2 - 2.9$, in an average of 2.6). The L/d_2 ratio ranges from 1.1 to 1.8, with an average of 1.4. The sleeve is usually extended to the rear part, the blade in the longitudinal section is bent towards the sleeve so that its tip lies on the plane formed by the lower faces of the sleeve. Almost all tips have a weld on the working edge. The main direction of development over time is an increase in all absolute dimensions with a faster growth of the total length.

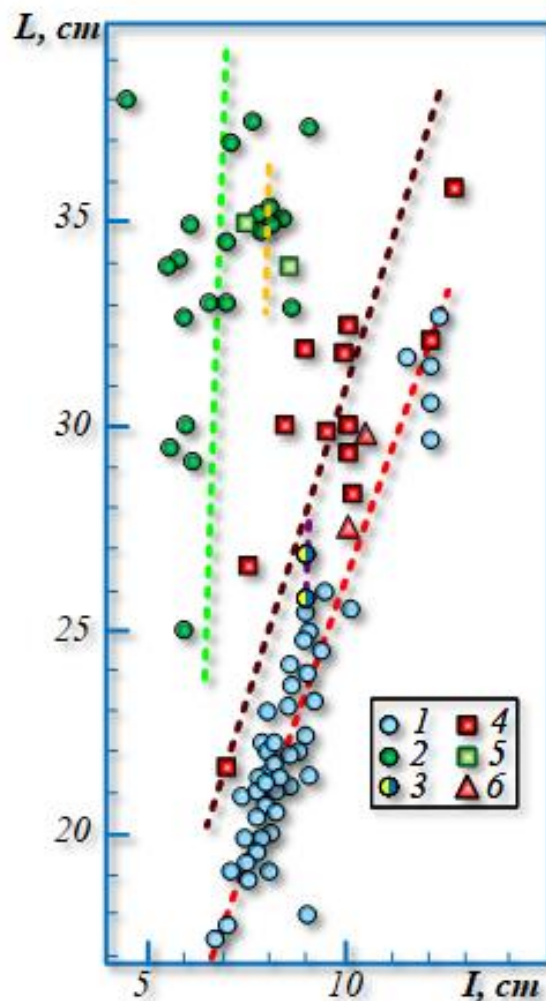


Fig. 30. Types of tips of group IV according to the correlation of absolute dimensions L and I (notations are the same as in Fig. 29)

Known from the sights of Kyivan Rus (mainly the forest-steppe zone) no earlier than the XI-XIII centuries.

Type IVB2 (22 copies; see fig. 15, 1, 2) - massive symmetrical tips 23.8-38 cm long with a relatively short sleeve. The ratio of the total length of the tip to the width of the sleeve (L/d_1) varies from 1.7 to 2.6, being on average 2, the length of the sleeve is from 1/3 to 1/8 of the total length of the tip ($L/I = 3.2- 7.6$, on average 5). The L/d_2 ratio ranges from 1.2 to 1.8, with an average of 1.4. The working end is pointed or moderately pointed. Almost all tips have a weld along the working edge of the blade. The sleeve is usually extended towards the back. The blade is curved in longitudinal section in the same way as type IVB1. There are no noticeable changes over time in the tips of the considered type.

They differ from tips of type IVB1 in terms of proportions (primarily the value of the L/I ratio), greater overall length and slightly wider blade width, shorter sleeve length and width for the same overall length. The degree of change in the length of the sleeve with the increase in the total length of the tips turns out to be significantly smaller.

They originate mainly from the territory of Volga Bulgaria, where they were known both in the pre-Mongol,³⁸ and Golden Horde³⁹ times. Most of the studied specimens cannot be precisely dated⁴⁰. One copy was found in Verkhnyi Prykamy⁴¹.

Type IVB3 (2 copies; see Fig. 14, 4) - massive symmetrical tips 27.5-30 cm long with a rounded working end. The main ratios are close to those for type IVB1 ($L/d_1 = 1.9-2$; $L/d_2 = 1.3-1.4$; $L/I = 2.8-3$). The sleeve has almost the same width along the entire length. The blade is almost straight in longitudinal section. They differ from type IVB1 tips in shape details (rounded end of the working part, lack of blade bending towards the sleeve and expansion of the latter to the rear part), from type IVB2 tips, in addition, in proportions and average sizes.

They are known from the regions of Upper and Middle Kamia, where they can be dated to no earlier than the 13th-14th centuries.⁴²

Type IVB4 (12 copies; Fig. 16, 1) - massive tips with a blade in the form of a triangular triangle, i.e., those with a rather well-defined right-sided asymmetry. The length is 21.5-36 cm, the working end is moderately pointed. On the edge of the blade, there is an ordinary burn. According to the characteristics of the cross-section and longitudinal section of the sleeves and the longitudinal section of the blades, they are similar to the tips of type IVB1. Their proportions are also close ($L/d1 = 1.4-2.1$, on average 1.8; $L/d2 = 1.1-1.7$, on average 1.3; $L/I = 2.7-3.5$, on average 3.2). They differ from tips of type IVB1 by the asymmetry of the blade, on average larger absolute dimensions, relatively longer sleeve, from type IVB2 they clearly differ in proportions, from type IVB3 - in shape details. The asymmetry of the blade also differs from the last two types.

Found in monuments of Kyiv Rus⁴³, Moldavia⁴⁴ and Middle Volga region⁴⁵ of the post-Mongol period. Some of the tips come from random finds and can be dated only by analogies.

Type IVB5 (3 copies; see Fig. 16, 2) - massive tips with a blade in the form of a multi-sided triangle, which has a right-sided asymmetry, with a moderately pointed working end and a short sleeve. The total length is 34-35 cm, the proportions are close to those for tips of the IVB2 type ($L/d1 = 1.7 - 1.9$, on average 1.8; $L/d2 = 1.4$; $L/I = 4-4.7$, on average 4.4). Features of the cross-section and longitudinal section of the sleeve and the longitudinal section of the blade are similar to those observed in all tips of group IV, except for type IVB3. They differ from tips of type IVB2 by asymmetry of the blade and an average longer sleeve, from asymmetric tips of type IVB4 - by proportions (mainly L/I ratio) and to a lesser extent by absolute dimensions. One of the tips was found at the Bulgarian settlement in the layer of the Golden Horde period, the others come from random finds⁴⁶.

Type IVB6 (2 copies; see Fig. 16, 3) - massive tips with a blade in the shape of a right triangle, with right-sided asymmetry. In terms of size and

proportions, they do not exceed the parameters typical for IVB4 type tips ($L = 25.7 - 27$ cm, on average - 26.4 cm; $d1 = 18-21$ cm, on average 19.5 cm; $d2 = 22 - 23.6$ cm, on average 22.8 cm; $l = 9$ cm; $L/d1 = 1.3-1.4$; $L/d2 = 1.1-1.2$; $L/l = 2.9- 3$), differing from them only in the shape of the blade. They differ from asymmetric tips of type IVB5 in the shape of the blade, dimensions, and proportions. They come from excavations in the villages of Moldavia and date from the XV-XVII centuries.⁴⁷

For most of the considered types, all dimensions increase over time, with the total length increasing faster than other parameters.

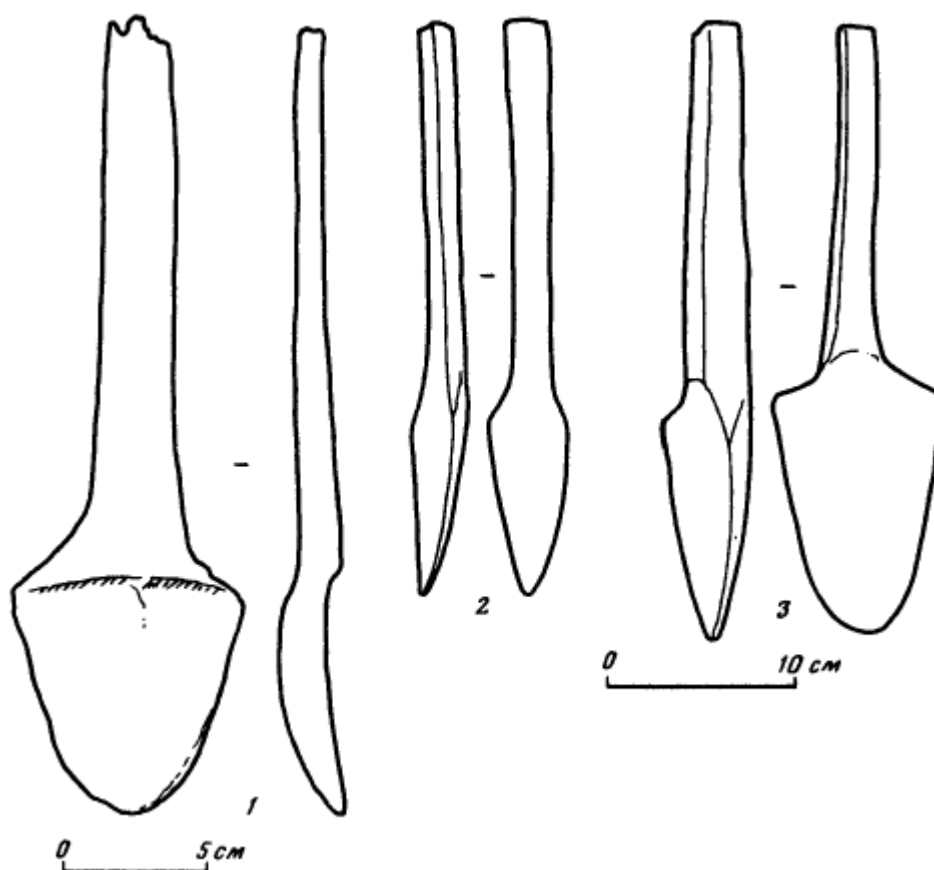


Fig. 31. Axial tips:

1 – Semenivka settlement; 2, 3 – Raykovets settlement

Percussive tips are uniform in shape, but vary considerably in size. According to the features that are the basis for the division of sleeve tips into

groups, they converge with group II. All of them have a blade, the width of which is significantly greater than the width of the petiole, so they should be classified as subgroup B (broad-bladed). Despite significant differences in size and some differences in shape, they can be classified into one type.

Type SBI (12 copies; Fig. 31) - massive tips with a relatively short blade with a shape approaching a diamond, and long petiole, usually rectangular in cross-section. The blade in the longitudinal section in most specimens is straight, in a few it is slightly bent downwards. The cross-section of the blade is usually straight. The total length varies from 24 to 77 cm, the length of the blade - from 6 to 14 cm, the length of the petiole - from 16 to 63 cm, the largest width of the blade - from 5 to 11 cm, the average length of the petiole - from 2.8 to 5 cm. the ratio varies within the following limits: L/d_1 - from 6.3 to 25.5; L/d_2 - from 3.3 to 15.4; L/l - from 1.2 to 1.8.

Known on the ancient monuments of the Northern Black Sea region of the end of the 1st millennium BC. e. – the beginning of the 1st millennium AD e., in the Baltic States at the beginning of the 1st millennium AD. e. (the specified specimen was unavailable for measurements), on the monuments of the Middle Dnieper region of the XI - XIII centuries, Volga Bulgaria, as well as in Sarkel (White Tower) and on the Mayak settlement of the Salto-Mayan culture. The last two measuring tips were not available.

Combs (in our material 80 note 52), with the exception of one, similar in shape, are massive and long knife-like objects, in which the cutting part and the handle stand out, with the help of which the comb was attached to the wooden parts of the plowing tool (Fig. 32). They differ from each other in size, as well as the degree of curvature of the cutting part forward.



Fig. 32. Chairs from Volga Bulgaria

A sleeve object was found at the Novotroitsky settlement (end of the 8th - beginning of the 10th century), which is probably rightly interpreted as a comb [I. I. Lyapushkin, 1958, p. 145, 211, tab. XXXV, 3], but which does not find analogies in the archaeological material. Its total length is 38 cm, the length of the sleeve is 10 cm, the width of the sleeve is 6.5 cm. The sleeve is bent from the longitudinal axis of the cutting part at an angle of about 20°.

The sizes of the brushes also increase over time. Thus, during the Chernyakhiv period, the length of cheresel ranged from 32.5 to 42 cm, with an average of 36.5 cm, in the second half of the 1st millennium AD. e., from 36 to 45 cm, on average 43 cm, in the XI-XIII centuries, from 36 to 55 cm, on average – 47.5 cm, in the XIV-XVI centuries, from 38 to 60 cm, on average – 51 cm.

For further research, it is important which of the considered types of tips worked in a position close to horizontal, and which – at an angle to the ground.

After all, the differences in the position of the working part largely determine the agrotechnical properties and the structure of the body of plowing implements.

In the literature, there are quite straightforward solutions to the given question, which boil down to the indication of one feature, which supposedly makes it possible to clearly divide the tips into groups according to the nature of the work. Yes, according to V.Y. Dovzhenka, all tips with a blade narrower than the sleeve (in practice, these included the tips that we distinguish in subgroup B) worked obliquely, all wide-bladed – in a horizontal position [V.Y. Dovzhenok, 1961, p. 61, 66]. According to A.V. Kiryanova, all tips with a sleeve open from below, oblong-oval in cross-section, are adapted to be installed on tools "almost parallel to the surface of the soil", and all tips with a rounded cross-section of the sleeve were intended for work in an inclined position [A.V. Kiryanov, 1959, p. 319, p. 344-345].

The specified features should undoubtedly be taken into account in specific studies. However, they are unlikely to be general and universal. The experience of studying the tips of plowing tools based on ethnographic materials shows that when trying to judge the features of the design of tools based on the remains of their iron tips, more or less reliable results can be obtained only by taking into account several features in their mutual connection.

Thus, tips, the intact point of the blade of which is bent in the direction of the hub (i.e. downwards) and lies on the plane formed by the lower faces of the hub, as in plows and plowshares of the recent past, had to work in a position close to horizontal. On the contrary, a blade bent in the opposite direction from the sleeve (that is, forward) should indicate the operation of the tip in an inclined position [A.V. Kiryanov, 1959, p. 347-348]. This is the shape of the blade often used by coulter from ethnographic materials. The tips, which had a straight line in the longitudinal section of the blades, could work both in an inclined position and in a position close to horizontal. The sleeve, which expands significantly

towards the back, rather indicates the fixing of the tip on a horizontal rung, which is usually wedge-shaped. On the contrary, the presence of a sleeve of more or less the same width along its entire length in large tips indicates, above all, that the tip is working in an inclined position.

Tips working in a position close to horizontal usually have sharpened side faces of the blade and point, which helps to cut the roots of grassy vegetation and cut the soil layer from below. In tips working at an angle to the soil, sharpening of the side faces of the blade is unnecessary and usually absent, and the working end is often blunt or rounded. The operation of the tip in a position close to horizontal can be evidenced by a weld along the working edge of the blade, which protects the tip from premature wear in places that experience the greatest resistance. The considerable length of the sleeve and its massiveness rather indicate the operation of the tip in an inclined position.

One more important feature should be indicated, the use of which is possible not for individual tips, but only for their series, similar in basic features, in our material – for types of tips.

In a series of tips that work in a horizontal position and differ in size despite an undoubted functional similarity, with an increase in overall length, the width of the sleeve increases more quickly than in tips that work at an angle. This is natural: after all, a slide that works in a horizontal position is always made of a wedge-shaped shape, because the function of expanding the furrow lies on it, and the width of the slide depends on both the productivity and, to a large extent, the stability of the tool. On the contrary, in a series of tips that work at a significant angle to the ground and differ in size, with an increase in the total length

the width of the sleeve grows more slowly: the working body of such tools is usually made of approximately equal width along the entire length.

The change in the width of the sleeve (d_1) in connection with the change in the total length (L) of the tip can be depicted in the coordinate system in the

form of a regression line. As can be seen in fig. 33, the angle of inclination of the regression line on the graph of the change in the width of the sleeve with increasing length for the tips of plow shares will be significantly different from the same angle for those working in an inclined position (see also appendices 4, 5).

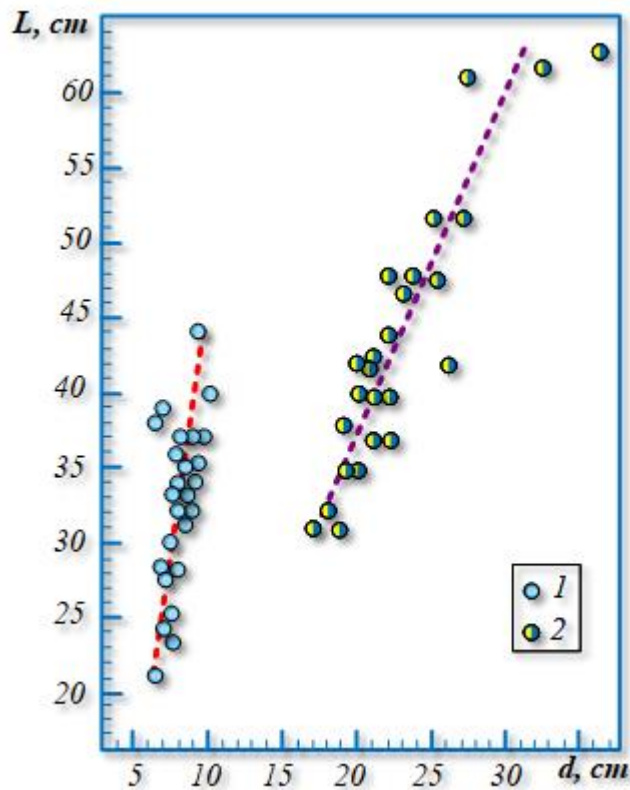


Fig. 33. The increase in the width of the sleeve with increasing length for tips:

1 – for a series of openers; 2 – for a series of plowshares

Similar graphs can be constructed for different types of tips from archaeological finds (compare, for example, fig. 21, III and fig. 27, I; 28, II). It is necessary, obviously, to assume that those types of tips for which the graph of the change of d_1 with an increase in L will be similar to the same graph for "ethnographic" plowshares that worked on tools with a horizontal slide, belonged to plowing tools with the same structure of the working part. Those types of tips for which the graph of change d_1 in connection with the change of

CHAPTER 2

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<i>II</i> <i>B1</i>																			
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CHAPTER 2

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features of the latter, but also to the fact that the tips of well-known tools served as prototypes of the tips of new tools, which were used for a long time.

At the same time, there are no less numerous examples of the fact that the tips of the same type of plowing tools can change their size, shape and proportions over time, i.e., based on the criteria we have adopted, belong to different types. Thus, in the process of development of single-sided plowshares with an almost unchanged body, their tips began to differ significantly from early, similar plowshares of folding plowshares [D. Zelenyn, 1907, p. 56]. Plows of one-plough plows in the second half of the 18th century. had the shape of an equilateral triangle, in the middle of the 19th century. was described sabans made of plowshares in the shape of a right triangle. At the same time, the tools themselves have not changed in their main features. The plowshares of traditional Ukrainian plows also changed [V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi, 1971, tab. VIII]. Thus, there may be a change in the types of tips, due not to a change in the design of the plowing tool, but to the improvement of the working qualities of the tips.

There are known cases when structurally and functionally different plow implements were equipped with identical tips. Thus, the North Estonian plows with long "cranes" were equipped with the same tips, and the South Estonian plows with a curved handle, which differed from them in the structure of the body [cf. Feoktistova L.X., 1980, fig. 20 and 25]. On "drawing boards" or "sections" feather coulter of translating plows, set with the "feather" forward, were often used as tips [Zelenin D., 1907, p. 75.

All this shows that, although raising the question about the genetic relationships of the tips of plowing tools from archaeological materials is legitimate, an unequivocal interpretation of such relationships is impossible. In some cases, such connections may testify to the genetic "kinship" of plowing tools, in others - to the improvement of the tips of the same tools, in others - to not carry any information about the origin of these tools.

Let's turn to the archaeological material. The criteria for distinguishing tips between which genetic connections are possible should be, obviously, the same ones by which their types were distinguished, that is, shape, absolute dimensions and proportions, direction of development in time. Chronological ratios of tip types, their territorial distribution, and nature of work should be taken into account.

From these positions, attention is drawn to the closeness of the shape and proportions of the tips of types IA1 and IA2 (Tables 1, 2; Fig. 20, I). It can be assumed that tips of type IA2 were made taking into account the shape and proportions of earlier tips of type IA1, but for other tools that had a wider wooden working part, placed obliquely, and, judging by the massiveness and rounded end of the working part of the tips, they were intended for work on heavy soils.

Tips of type IA4 are close to type IAZ in terms of shape and direction of development; their small differences in proportions. In terms of the overall length and width of the sleeve (a very important feature that indicates the width of the working part of the tool), type IA4 tips seem to continue the series of IAZ tips, but differ in the longer length of the sleeve (Fig. 20, II, III) and the bluntness of the working end of the blade. The latter may indicate their work in an inclined position on heavy soils. Presumably, IAZ and IA4 type tips were equipped with very close, perhaps identical in structure, tools, but those that were used in different conditions. At the same time, tools with type IA4 tips were larger in size

It would be tempting to talk about the genetic connection of the earliest narrow blade tips of the IA1 type with the IAZ type as well. However, the similarity between them can be traced only in a general form, and the genetic connection can therefore be considered quite conditional.

All tip types of subgroups B and B of group I appear to be quite similar in general shape, which can be explained by working in a position close to

horizontal. A more detailed comparison of their characteristics makes it possible to reach the following conclusions.

There is a significant similarity between tips of type IB1, on the one hand, and types IB1 and IB2, on the other. Types IB1 and IB1 are especially close to each other: their overall length, width and sleeve length, as well as proportions, are largely the same. Differences are observed in the relative and absolute width of the blade, which are larger in tips of type IV1 (see Tables 1, 2; Figs. 21-23). This is quite understandable due to the improvement of the tips themselves: in plowing tools, the working part of which is in a position close to the horizontal, an increase in the width of the blade of the tip leads to an increase in the productivity of the tool.

In the same direction, there are differences between tips of types IB1 and IB2. However, these types also differ in other features. Having very close limits of variation in the width of the sleeve, tips of type IB2 for the same length are slightly smaller in width than tips of type IB1. The length of the sleeve in them is also shorter, although the direction and degree of increase of these values with the increase in the length of the tip are the same (cf. Fig. 21, III, IV and Fig. 23). The specified circumstances can be explained by the increase in the length of the slide in the tool, which was provided with tips of type IV2, as well as by its closer to horizontal position.

In terms of shape, sleeve dimensions, and blade width, the IVZ type tips are chronologically very close to the IV2 type tips, the narrow range of which partially coincides with the range of the IV2 type tips. The genetic connection of these types is quite probable. However, the tips of the IVZ type are much longer, which also affects the differences in their proportions. It can be assumed that plowing tools equipped with tips of type IVZ were close to tools with tips of type IV2, but had a longer and relatively narrower slide. In longitudinal section, the latter was probably high, wedge-shaped, so that its rear part was higher than the front. This circumstance can be explained by the direct longitudinal section

of the blade in the tips of the IVZ type.

Far from being standardized, it is difficult to connect IV4 type tips genetically with any one of the considered types. In terms of proportions, they are closest to type IV2 (cf. Fig. 22, 2-4); by the total length, the greatest width of the blade and some details of the form - to the large tips of type IB1, common in the adjacent territory. The difference in the width of the blade here, as already noted, can be explained by the improvement of the tips that worked in a close to horizontal position. The relatively small length of the sleeve, which did not change much with the length of the tips (see Fig. 23), as well as the fact that in many tips of this type the blade was straight in longitudinal section, brings these tips closer to the IVZ type. It is possible that the considered type was formed on the basis of large tips of type IB1 under the influence of the shapes of tips of types IB2 and IVZ. As for the plowing tools themselves, which were equipped with tips of type IV4, they were probably close to tools with tips of type IV2, but had a higher and possibly shorter slide.

Practically the same width of the sleeve of the tips of group II (see Fig. 25, 1), suggests that they were all used on the same or very similar tools. From the features of the shape, it is obvious that the tips of type I IB1 can be considered as a further development of tips of type IIB1: here there is an increase in the width of the blade, which increased the working qualities of the tips, as well as an increase in their overall length (see Table 1). Later tips of type IIB2 are characterized by an even wider blade on average (see table 2), but their overall length is slightly reduced due to a reduction in the length of the sleeve. The excessively large value of the latter, characteristic of type IIB1 tips, apparently turned out to be unnecessary in the end.

All types of tips of group III, the ranges of which almost completely coincide, and a certain sequence is observed in the time of appearance, appear to be genetically related. Their proportions coincide to a large extent, close variations in absolute sizes that increase over time (see Tables 1, 2; Figs. 26-28).

A gradual change in the shape of the tips is observed: the development goes from tips with a blade narrower than the sleeve (type IIIA1) to tips whose blade is equal to the width of the sleeve (types IIIB1 and IIIB2), and further to tips with a blade wider than the sleeve (types IIIB1 and IIIB2). Presumably, asymmetric tips in subgroups B and B generally appear later than symmetrical ones. The proximity of the tips of these types indicates their use on very similar tools.

The genetic connection of tips of types IVB1 and IVB4, which are common in the same territory, and the latter – with type IVB6, is quite obvious. All their main parameters coincide, showing a gradual increase in tips over time (see Tables 1, 2; Figs. 29, 30). The differences in the shape of the tips - the transition from symmetrical to asymmetrical, first in the form of a multi-sided, and then a right triangle - can be explained by the improvement of the shape of the tips, which does not significantly affect the structure of the tools themselves, for which they were intended. The genetic connection of symmetric tips of type IVB2 and asymmetric type IVB5, common in the same ethnic environment, is equally clear based on the indicated features (see Tables 1, 2; Figs. 29, 30).

Establishing genetic links between tips of different groups seems to be more difficult. However, even a purely formal approach, which we use here, can give certain results.

Thus, it seems very likely that the tips of group II and petioles have no appreciable genetic connections with any of the types belonging to the other groups.

It is difficult to trace any connection between the tips of group III and any particular type from group I, much less IV. A very distant similarity in form, dimensions and proportions can be established only between the earliest type IIIA1 in group III and the narrow blade tips of group I in general.

More similarities between individual tip types of groups I and IV. Thus, a comparison of tips of types IV4 and IVB3, close chronologically and distributed

in the same territory, shows a significant similarity in their shape and proportions (see Table 1). IVB3 tip tips appear to continue the series of IVB4 tip tips (Fig. 35), which suggests a genetic connection between them.

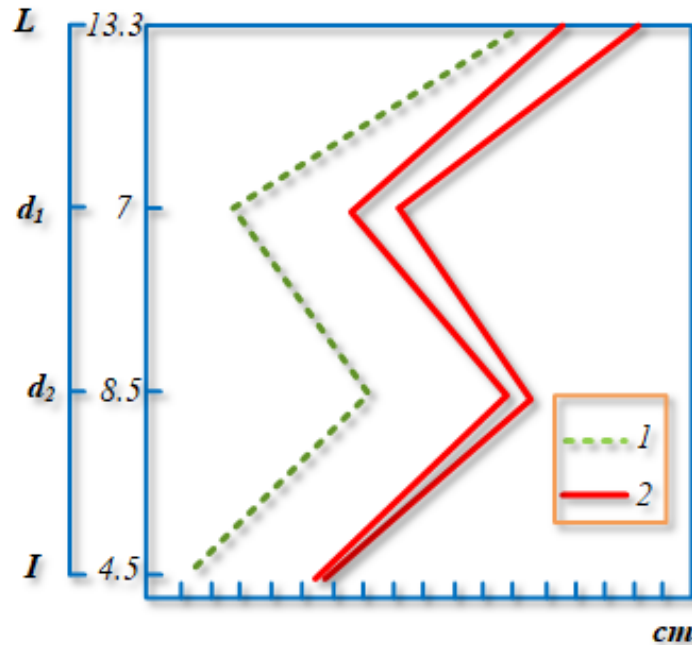


Fig. 35. Absolute dimensions of tips of type IV4 (1) and IVB3 (2)

The genetic connection of tips of types IV2 and IVB1 seems quite probable. They are close in shape, their overall length and the length of the sleeve partially coincide, of all the types of tips of group I, it is the tips of type IV2 that have the greatest proximity in proportions to tips of type IVB1. The same direction of development of the tips in question over time (see Table 1, 2; Fig. 22, 2; Fig. 29, 1). However, these tips were equipped with clearly different tools: this is evidenced by the fact that the width of the sleeve in type IVB1 tips is twice the same value for tips of type IB2, the greatest width of the blade is slightly different (Fig. 36). In the same method can be used to establish the genetic connection of IV3 and IVB2 tips, which are common in a culturally related environment and which do not have a significant gap in time. Their total length and the length of the sleeve partially coincide, being generally larger in tips of type IVB2, which is quite natural for later tips (Fig. 37).

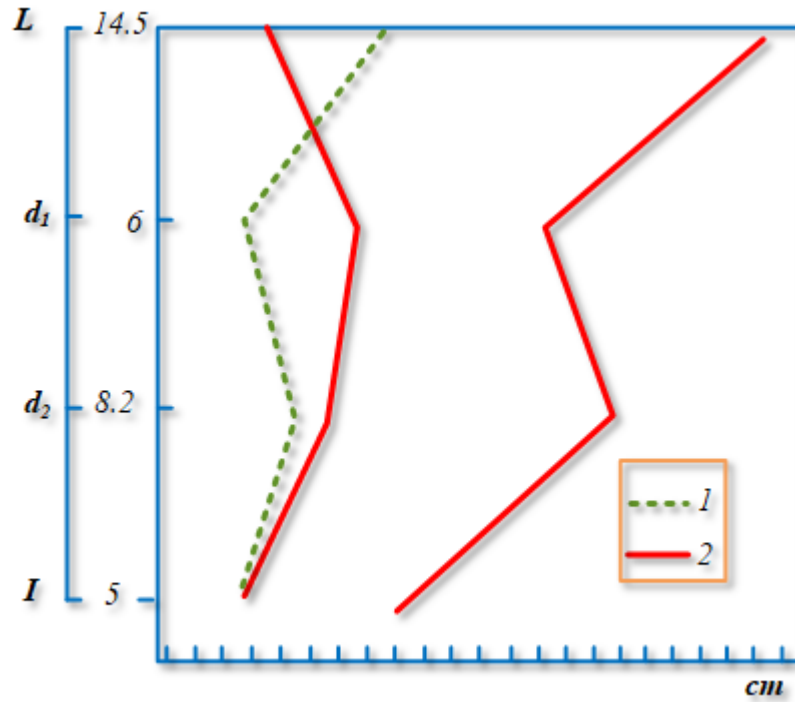


Fig. 36. Absolute dimensions of tips of type IV2 (1) and IVB1 (2)

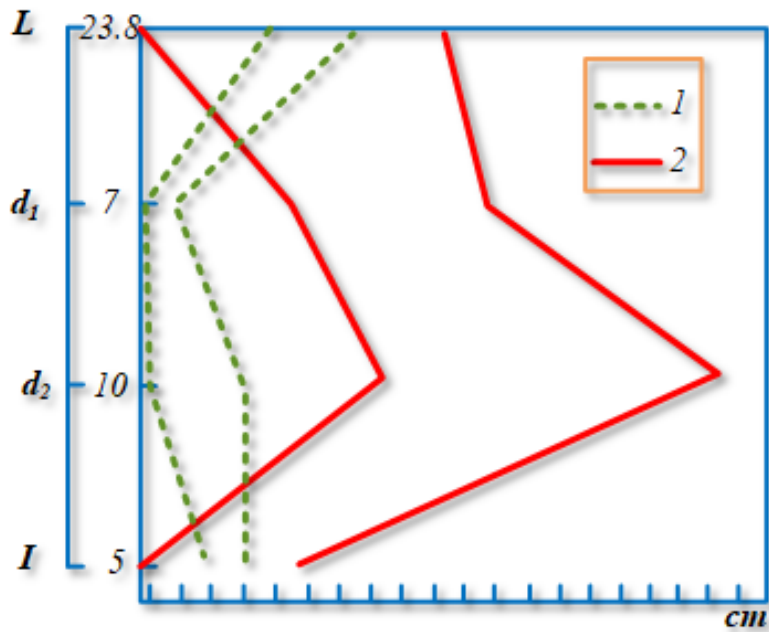


Fig. 37. Absolute dimensions of tips of type IV3 (1) and IVB2 (2)

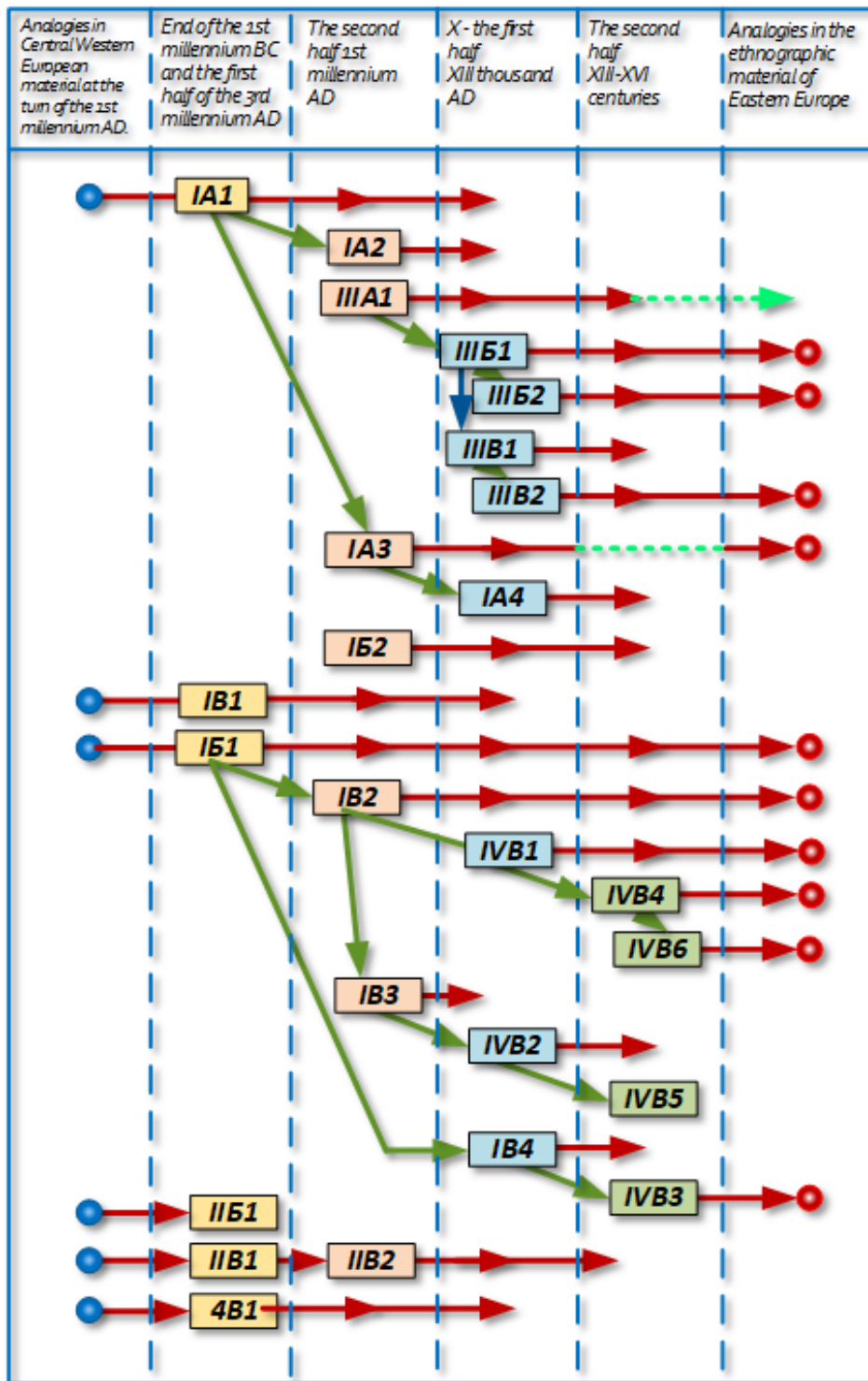


Fig. 38. The scheme of presumed genetic relationships between the types of working tips of plowing tools from the archaeological materials of Eastern Europe

The orientation and degree coincide changes in the size of the sleeve and

the width of the blade with a change in the total length of the tips. Only these types of all broad-bladed tips of groups I and IV are characterized by a relatively short sleeve, which almost does not change in length with a change in the total length of the tips (see Table 1).

The scheme of the expected development of the tips of plowing tools from Eastern European archaeological materials, compiled on the basis of establishing possible genetic links between their types, is presented in fig. 38.

It is possible to verify the assumption expressed above that the groups of bushing tips reflect their belonging to different groups of plowing tools, which differ in functional characteristics and the structure of the body, in almost the only way - by comparing tips from archaeological and ethnographic materials according to the same features. However, the tips of traditional plowing tools of the recent past, unlike the tools themselves, were not subjected to special research. Real examples of such tips are sometimes kept in museums and individual peasant farms, but they are few and not always precisely "tied" to specific tools. We used the results of measurements of about 80 specimens of such "ethnographic" tips - naralniks, coulter of double-toothed plows and plowshares of ancient plows from different regions of the considered territory (see appendices 3-5). Although such a sample is small, it is still quantitatively comparable to the sample for "archaeological" tips and can help in solving the question.

As a result of such a comparison (Figs. 39-41), it becomes clear that the tips of group I from archaeological materials can be identified only with the working tips of single-toothed rales. Their form does not contradict this. Among the "ethnographic" divers, as well as their "archaeological" counterparts, there are narrow-bladed ones, with a blade that slightly exceeds the width of the sleeve, and wide-bladed ones. Their sleeve is weakly closed and in cross-section gives a more or less elongated oval. In broad-bladed divers, the blade in the longitudinal section is usually slightly bent towards the sleeve, in narrow-bladed

divers it is almost straight. The working edge of the blade of most "ethnographic" lancets is moderately pointed, as in Group I tips from archaeological materials.

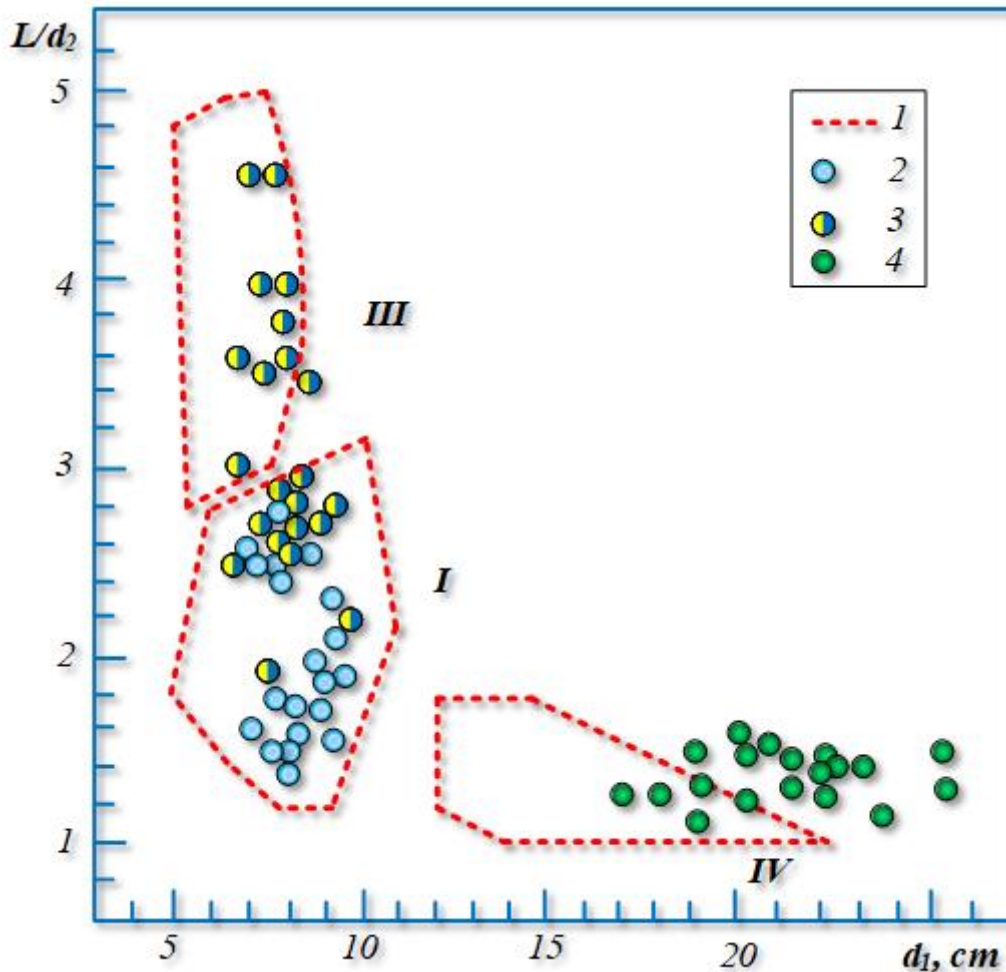


Fig. 39. Comparison of the tips of plowing tools from archaeological and ethnographic materials according to the correlation of the ratio of the total length to the greatest width and the absolute dimensions of the average width of the sleeve: 1 – limits of variations of groups of tips from archaeological materials (I – group I; III – group III; IV – group IV); 2 – bibliographies from ethnographic materials; 3 – coulter tips from ethnographic materials; 4 – plowshares from ethnographic materials.

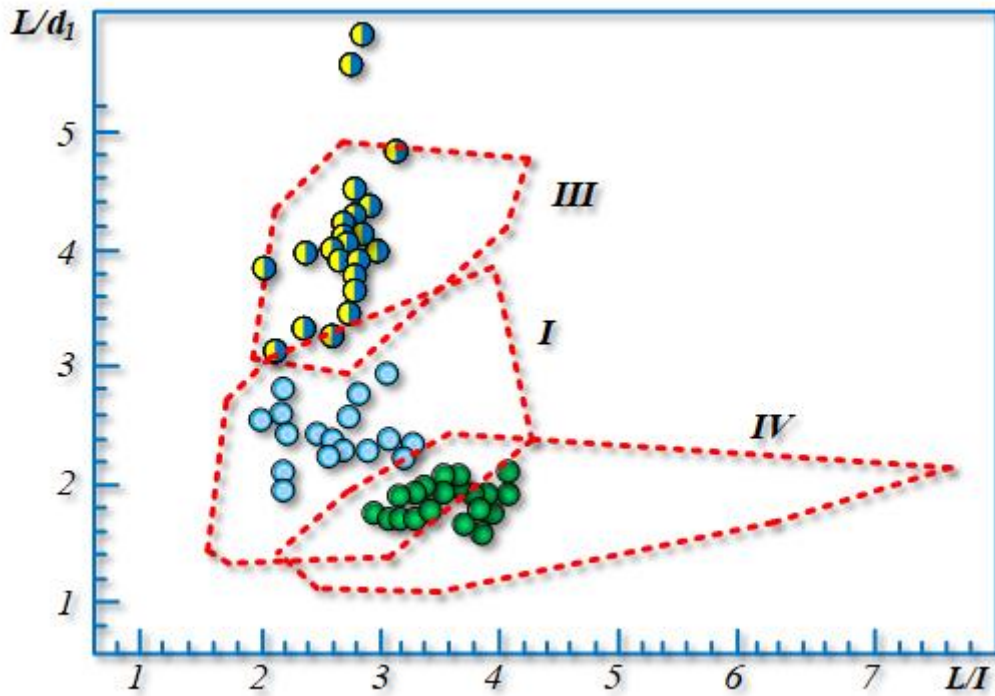


Fig. 40. Comparison of the tips of plowing tools from archaeological and ethnographic materials according to the correlation of the ratios of the total length to the width of the sleeve and the total length to the length of the sleeve (notations are the same as in Fig. 39).

The limits of change of all the main parameters of "ethnographic" narals are smaller than those of group I tips. This is explained by the fact that the ral tips we used for comparison were from the 19th – early 20th centuries. were intended for tools for secondary cultivation of land already raised by a plow or a horned plow. At the same time, most of the tips of group I from archaeological materials belong to the period before the appearance of the plow and other plow-type tools and should have been used primarily for primary plowing. Differences in the field of application of RAL affected the size of their tips.

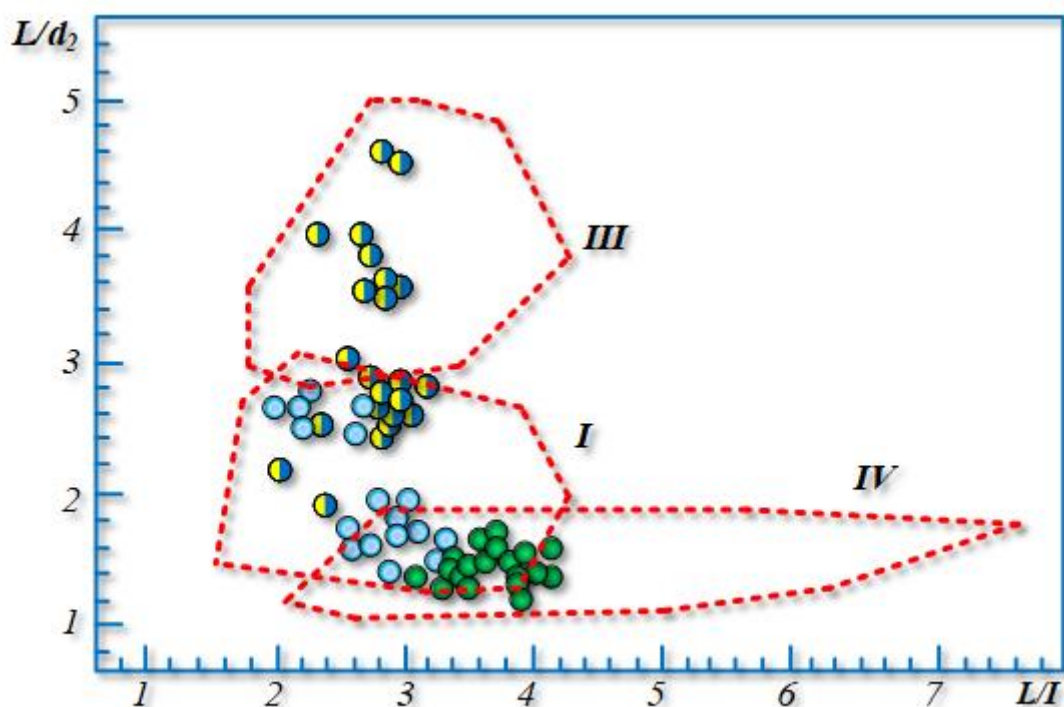


Fig. 41. Comparison of the tips of plowing tools from archaeological and ethnographic materials according to the correlation of the ratios of the total length to the greatest width and the total length to the length of the sleeve (notations are the same as in Fig. 39)

With no less reason, it is possible to identify the tips of group III with the coulter tips of two-toothed plowshares. Significant differences between these latter and group III tips in the value of the ratio L/d_2 (Fig. 39) are explained by the fact that the majority of measured coulter tips of the 19th and early 20th centuries belongs to the feather type, that is, those that have a blade that is much wider in width than the sleeve. Such openers were common at that time almost everywhere in the area of plowing [Zelenin D., 1907, p. 31, 33, 83, 137 – 186]. In the archaeological material, such tips are rare, and the width of the blade is much smaller in them, although the other dimensions are quite close. At the same time, the main ratios of circular coulter tips, the blade of which is not wider than the sleeve and is often symmetrical [Zelenin D., 1907, p. 31, 32], in most cases do not go beyond the limits characteristic of group III tips. The upper

limits of the absolute dimensions of "ethnographic" openers exceed the same indicators for the tips of group III, which is explained by the general tendency to increase the length of the tips over time. In terms of shape, most of the tips of group III are identical to the coulter tips of circular plows, others resemble feather coulters, differing in slightly smaller feather sizes.

The tips of group IV can be compared from the "ethnographic" tips only to plowshares and plowshares. Their main proportions are close, the significant differences in absolute sizes are explained, obviously, by the fact that the tendency to increase the size of the tips over time is particularly vivid here. The main differences are in the shape of the blade: in most tips of group IV, it is symmetrical or has the shape of an equilateral triangle, in most plowshares from ethnographic materials - the shape of an equilateral or, more often, right triangle. The reasons for this, as already mentioned, lie in the historical development of the forms of iron plow tips.

Socket tips of group II, as well as petiole tips, do not find parallels in the ethnographic material of Eastern Europe. Obviously, such tips, as well as the plowing tools themselves, which were equipped with them, have long gone out of use here. Ethnographic materials of the neighboring territories, as well as some iconographic data about tips, data and real finds of ancient plowing tools allow us to assume that such tips were provided by the so-called additional plowshares of some plows with a skid placed at an angle to the soil [Y. A. Krasnov, 1976, 1981]. A more detailed description of such plowing tools will be given below.

Thus, we can, with sufficient grounds, connect the sleeve tips of groups I and II, as well as the petiole tips from archaeological materials, with plows and call them plowshares, the tips of group III with plows and call them plowshares, the tips of group IV with plows and refer to plowshares. The experience of specific "tying" of certain types of tips to certain types of plows, axes and plows, known from ethnographic, archaeological and ancient iconographic materials,

we will try to do below - in the sections devoted to the history of the mentioned groups of plowing tools.

An attempt to interpret as combs some large knife-shaped objects from the monuments of the Scythian era [Shramko B.A., 1961, fig. 10; Sramko V.A., 1973, fig. 3] appears to be unsuccessful [see about it: Yu. A. Krasnov, 1975, p. 131; 1981].

Voloske settlement in the Dnipropetrovsk region. [Braychevska A.T., 1957, p. 7; Rickman E.A., 1959, p. 116; Brychevskiy M.Yu., 1964, p. 30], Tyligulo-Berezanka in Odesa region. [Simonovych E. A., 1967, p. 219, fig. 8], Slobodyshchi in Zhytomyr region. [Braichevsky M.Yu., 1964, p. 31).

Settlement of the VIII-IX centuries. Strochytske in the Minsk region. and Volosovichi in the Vitebsk region. [Perhavko V.D., 1979], Pastoral settlement VII-VIII centuries. in Cherkasy region [Antiquities of the Dnieper Region, 1899, tab. V; V.Y. Dovzhenok, 1961, p. 32-33, fig. 8, 1].

Raikovetske settlement of the 7th - beginning of the 13th century. in Zhytomyr Region, 3 copies. [Molchanovsky F.Ya., 1935; Goncharov V.K., 1950, tab. V, 3; V.Y. Dovzhenok, 1961, p. 41-43, fig. 16].

Novogrudok, X-XI century layer. [F. D. Gurevich, 1965, p. 77, 79, fig. 32, 2]; Grodno, 12th-13th century layer. [N.N. Voronin, 1954, p. 57, fig. 23, 1]; settlement near the village Horodyshche in the Minsk region, layer of the XII century, and Lobozovka in the Grodno region, layer of the XI-XII centuries. [T.N. Korobushkina, 1979, p. 20, 21, fig. 1, 2; 2, 2]. Several finds of similar tips are also known in the Baltic region, but they were not available for measurements.

Such a character of the working end of the tip from Beloozer could have resulted from activation.

Stara Ladoga, VI - VIII centuries. [Orlov S.Ya., 1956, p. 142 - 144, fig. 51; Kiryanov A.V., 1959, p. 315, fig. 2, 2; Myrolyubov M.A., 1972, p. 118-119,

fig. 1): Tartu, VII-VIII centuries. [Trummal V., 1964, tab. Vila]; Novgorod, X century. (2 copies) [A.V. Kiryanov, 1959, fig. 2, 3; coll. GYM]; Beloozero, 12th century layer. [Golubeva II A., 1973, p. 189, fig. 43, 5]. Obviously, the fragmented tip found in the town of Horodnia (10th-12th centuries) in the Kalinin Region should belong to the same type. [S.A. Tarakanova, 1947, fig. 58, 8; Nikishin II, 1947].

The village of Volyntseve (VII-VIII centuries) in the Sumy region. [D.T. Berezovets, 1952, p. 249; V.Y. Dovzhenok, 1961, fig. 10, I]; Raikovets hillfort of the 12th-early 13th centuries. in Zhytomyr Region, 3 copies. [F.P. Molchanovsky, 1935; Goncharov R. K., 1950, tab. V, 4, .5; V. Ya. Levashova, 1956, p. 33, fig. 5, I]; City hillfort of the XI-XII centuries. in the Zhytomyr region. [Dmitrievskaya A., 1949, p. 43; V.Y. Dovzhenok, 1961, fig. 18, 1].

Chichersk, layer of the XII-first half of the XIII century. [T.Ya. Korobushkina, 1979, p. 28, fig. 2, 6].

Kich-horodok, XVI century. [A.V. Nikitin, 1965, fig. 53, 11; 1971, tab. 1, I].

Carib hillfort in Koma ASSR, XII century. [Savelyeva E. A., 1971, tab. 30, 1]; number Verkh-Invensk parish of Perm province, approximate date - XII-XIV centuries. [A.A. Spitsyn, 1902, tab. XXX, 9].

Settlement of the Chernyakhiv culture Zagaikany in the Moldavian SSR, Strymba in the Odesa region. [E.A. Rykman, 195 p. 116, fig. 51, I], Oselivka (Lenkivtsi) in Chernivtsi region. [Fedorov G.B., 1954, p. 9, fig. 2], Krynychki in Odesa region. [E.A. Simonovych, 1960, p. 249, fig. 3, 2], Azelinsky cemetery in the Kirov region, V (?) century. [Gening V.F., 1963, tab. XXII, 5]; settlement of Osh-Pando VI-VIII centuries. in the Mordovian ASSR, 3 copies. [Stepanova P.D., 1967, tab. XVIII, 1, 2; XVIIIIB, I]; Pastoral settlement VII-VIII century, VIII century, in the Cherkasy region. [Antiquities of the Dnieper Region, 1899, tab. V; Dovzhenok V., I., 1961, fig. 8, 3] Shcherbet village VI - VIII centuries. in the Tatar ASSR [Starostin P.Ya., 1967, tab. 13, 5]; Tashikermen and

Yantikovo hillforts in the Tatar ASSR, VI-VIII centuries. [Kalinin N.F., Khalikov A.Kh., 1954, fig. 16, 27; 53]; barrow near the Sholom sanctuary in the Tatar ASSR, VIII-IX centuries. [A. V. Kiryanov, 1958, p. 289, fig. 4]; Plisnesk settlement in the Lviv region, XI-XII centuries, 2 copies. [V.Y. Dovzhenok, 1961, fig. 21, 1, 2]; Kolodyazhyn settlement in Zhytomyr region, XII XIII century. [V.Y. Dovzhenok, 1961, p. 256, fig. 17, 1]; Tash-Kumak in the Tatar ASSR, X-XIII (?) centuries. [State Museum of the Tatar ASSR]; random finds on the territory of the Tatar ASSR, 3 copies. [Shtukenberg A., 1896, p. 211; A. V. Kiryanov, 1955, fig. 5, 3-4; State Museum of the Tatar ASSR]; accidental find near the village Danilovt kol. Perm province. [A. A. Spitsyn, 1902, tab. XXX, 13].

Art. Tamansk of the Krasnodar Territory (Tmutarakan), XI-XIII centuries. [V.P. Levashova, 1956, p. 32; coll. GIM]; Chersonesus, layers of the 10th-14th centuries, 5 notes. [Jacobson M.A., 1950, fig. 44; number Chersonese State Archaeological Museum-Reserve].

Drutsk [Alekseev L.V., 1966, p. 114, fig. 20, 1].

Settlement of Galish-Lovachka in Transcarpathian region, II century. to n. e. - I - II century. N. e. [Uzhhorod Local Lore MuseuPryazhev in Zhytomyr region. [Braichevsky M.Yu., 1964, p. 30].

Kkimautsi settlement in the Moldavian SSR, IX-X centuries. [G.V. Fedorov, 1954, fig. 6, I]; Gorodskoe settlement in Zhytomyr region, XI-XII centuries. [V.Y. Dovzhenok, 1961, p. 44, fig. 18, 2]; The Moiseiv settlement in the Kursk region, X-XIII centuries. [O.E. Alykhova, 1962, fig. 30, 3].

Hrachivka settlement in the Kaliningrad region, X-XI centuries. [F.D. Gurevich, 1953, p. 83; 1957, p. 46, fig. 13].

The village of Sakhnivka in the Cherkasy region, VI-VII centuries. (V.Y. Dovzhenok, 1961, p. 31, fig. 7); Pastoral settlement in the Cherkasy region, VII - VIII centuries. [Antiquities of the Dnieper region, 1899. table V; V. Y. Dovzhenok, 1961, p. 32, Fig. 8, 2]; Shuklinskos settlement in the Kursk region,

VIII X century [Nikolskaya T.N., 1958, p. 76, Fig. 22, I]; Penkivka village in the Kirovohrad region, VI VII century [D.T. Berezovets, 1959, pp. 42, 43; V.Y. Dovzhenok, 1961, fig. 9, 3; Emergence and development of agriculture, 1967, fig. 51, 2]; Khotomel village in the Brest Region. , VIII IX century [Y.V. Kukharenko, 1957, pp. 93-95, fig. 34, 4]; Bititsa settlement in Sumy region, VIII X century, 2 copies [I.Y. Lyapushkin, 1958 , table XXXVII, 1, 2]; Supruta settlement in Tula region, VIII X century, 3 notes [Izyumova S. A., 1970, p. 67; funds of the Archaeological Cabinet of MSU); Shmyryovo, Kursk region, accidental find [I.Y. Lyapushkin, 1950, fig. 5]; the village of Lebidka in the Oryol region, IX-X centuries. [Nikolskaya T.N., 1959, p. 58, fig. 24, I)]; Knyazha Gora settlement in the Cherkasy region, XI-XIII centuries, 2 copies. [Belyashevsky N., 1892, p. 32, 33; V.Y. Dovzhenok, 1961, p. 255, fig. 14, 1, 2]; Chervone hillfort in the Vinnytsia region, X-XI centuries. [I.Ya. Havlyuk, 1972, p. 381, IA funds of the Academy of Sciences of the Ukrainian SSR]; Lepliava settlement in Cherkasy region [Kyiv State Historical Museum]; Bila Tserkva, layers XI-XIII centuries. [Bilotserk Museum of Local Lore].

The right-bank Tsimlyan settlement in the Rostov region, VIII-XIX centuries, 3 copies. [I.Y. Lyapushkin, 1958, pp. 114, 117, 118, fig. 10; Pletneva S.L., 1967, fig. 38, 3; coll. GE].

The right-bank Tsimlyan settlement in the Rostov region, VIII-IX centuries, 2 notes. [S.L. Pletneva, 1967, p. 144, fig. 38, 9; GE funds]; Mayaki settlement in the Kharkiv region, VIII-IX centuries. (funds of the Cabinet of Archeology of Kharkiv State University).

Accidental finds near the villages of Gaya kake and Fedorovo kol. Perm province. (A. A. Spitsyn, 1902, table. XXX, 17, IS); hillforts of Kmlasovo (Anyushkar), XII-XIV centuries, Dondy-Kar (2 notes), Pesn-kar (2 notes) and Niger-shai in the Udmurt ASSR, IX XII centuries. (Ivanova M. G., 1978; Oboryn V. A., 1956; funds of the Cabinet of Archeology of Perm State University and the Scientific Research Institute under the Council of Ministers

of the Udmurt ASSR).

Halysh Novachka settlement in Zakarpattia region. Ukrainian SSR, II century to n. e. - I - II century. N. e., 3 copies [Uzhhorod Museum of Local Lore].

Halysh-Lovachka settlement in Zakarpattia region. Ukrainian SSR, II century to n. e. - I - II century. N. e., 3 notes, [Uzhhorod Museum of Local History]; Kruglik settlement in Chernivtsi region, 1st - 3rd centuries. N. e. (B.A. Tymoschuk, I.S. Vinokur, 1960, pp. 74, 75; S.P. Pachkova, 1974, fig. 18); accidental find near the village Klichanovo in the Transcarpathian region. (Chernivetsk Museum of Local Lore).

Perhaps close to the considered type of tips are tools found at some Meotian sites in the Kuban [N.V. Anfimov, 1941, p. 262, Blavatsky V.D., 1953, p. 108, fig. 36]. In the literature, they are usually considered as hoe tips. This interpretation of them cannot be considered unequivocal. Unfortunately, we did not have the opportunity to familiarize ourselves with these de vish tools.

Pereverzev settlement in the Kursk region, 10th century layer. (Materials of the 1980-1981 excavations of the Kursk expedition of the IA Academy of Sciences of the USSR).

Volynsiv settlement of the VIII-X centuries. in the Sumy region [V.Y. Dovzhenok, 1952a, p. 255, fig. 3].

The village of Lebidka in the Oryol region, VIII-X centuries. [Nikolskaya T.N., 1959, p. 60, fig. 25, 12].

Gomel [T.N. Korobushkina, 1979, fig. 2, 1].

Stara Ladoga, layers VIII-IX and X centuries. [V.I. Ravdonikas, 1950, fig. 35; Kiryanov A.V., 1959, fig. 2, 1; Myrolyubov M.A., 1972, p. 120, 121, fig. 3, 4].

Mounds near the village. Velika Brembola of the Yaroslavl region, XI century. [Uvarov O.S., 1982, tab. XXIX, 14]; the village of Vitsyzh in the Bryansk region, XI-XII centuries. [V.P. Levashova, 1956, fig. 5, 3]; barrows

near the village Vasylkovo Kol. Volodymyr province, XI-XII centuries. [A.S. Uvarov, 1872, p. 116, 149]; Vetsgublene, Latvian SSR, XI-XII centuries. [Moora N., 1952, fig. 102]; Volkovysk, 12th century layer. [Y.G. Zverugo, 1969, p. 383 -384, fig. 1, 7]; Perlyukalns settlement in the Lithuanian SSR, date unknown [State Museum of the Lithuanian SSR]; Seren settlement in the Kaluga region, XI-XIII centuries. [Nikolskaya T.Ya., 1981, fig. 90, 9]; Pskov, XI-XIII century layer. [Grozdilov G.P., 1962, fig. 46, 9]; Novgorod, layer XII-XIII centuries. [V.P. Levashova, 1956, fig. 5, 6]; Drutsk, XI-XIII century layer, Brest, XIV century layer, Volkovysk, XII-XIII century layer, Lukoml, XIII century layer, Logoisk, XII-XIII century layer, Logoisk, XII-XIII century layer. [T.Ya. Korobushkina, 1979, fig. 3, 6, 8; 4, 1, 3; 6, 7]; Konetspol, Latvian SSR, XI-XII centuries. [Alekseev L.V., 1966, fig. 19, 2]; Shamoky, Mariysk SSR, an accidental find [G. A. Arkhipov, 1973, p. 71, fig. 76, 2]; an accidental find on the territory of the Tatar ASSR, which probably belongs to the Bulgarian era [State Museum of the Tatar ASSR].

Novgorod, 11th century layer, 3 copies. [A.V. Kiryanov, 1959, p. 345], and XII-XIII centuries. [Novgorod Museum]; Toronets, 13th century layer, 3 copies. [Malevskaya M. Ya., 1963]; Yaronolch-Zalesky, Vladimir region, XI-XIII centuries. [M.V. Sedova, 1978, tab. 13, 5]; Seren settlement in the Kaluga region, XI-XIII centuries. [Nikolskaya T.Ya., 1981, fig. 90, 8]; Stara Ladoga, layers of XIII-XIV and XVI-XVII centuries., 3 copies. [Myrolyubov M.A., 1972, p. 122-123, fig. 5-7]; random finds from the territory of the Tatar ASSR, presumably attributed to the Bulgarian era, 2 copies. [State Museum of the former Tatar ASSR].

Novgorod, layers XII-XIII and XIII centuries, 3 notes. [Novgorod Museum]; Pskov, layers XI-XV and XIII centuries. [S.A. Tarakanova, 1953, fig. on the village 213; Grozdilov H.P., 1962, fig. 46, 10]; Polotsk, XI-XIII century layer. [Alekseev L.V., 1966, p. 112-114, fig. 19, 1].

Pyrrhic settlement in the Volodymyr region, XI-XIII centuries. (coll.

GYM); Tserkovyshchi settlement in the Smolensk region, XI-XIII centuries. [Sedov V.V., 1960, fig. 24, 3].

Grodno, XI-XII century layer. (rather - 12th century), 2 note. [T.Ya. Korobushkina, 1979, fig. 3, 1-2; 5, two objects on the right in the upper row]; Semeniv village in the Ryazan region, XI - XIII centuries. [Mongait A.L., 1961, p. 215]; Verkhivrazhia, Vologda region, an accidental find [V.Ya. Levashova, 1956, fig. 5a, 1]; Belhorod Kursk, XVI-XVII centuries. [A.V. Nikitin, 1962, p. 269].

Semeniv village in the Tatar ASSR, end of the 12th-beginning of the 13th century, 2 copies [Archaeological Cabinet of the Kazan University]; random finds in various areas of the Tatar ASSR, presumably attributed to the Bulgarian era, 3 copies [Shtukenberg A., 1896, p. 211; Kiryanov A.V., 1955, fig. 5, 2; V. Ya. Levashova, 1956, fig. 5a, 3; the State Museum of the Tatar ASSR and the State Museum].

Grodno, XI-XII century layer. (rather - 12th century), 2 note. [T.Ya. Korobushkina, 1979, fig. 3, 3, 4; 5, two items from the left in the upper row]; Semeniv village in the Tatar ASSR, end of the 12th - beginning of the 13th century, 2 copies. [Archaeological office of Kazan University]; number Kolomensky district of the Moscow province, an accidental find, dated by a number of signs to the XIII-XV centuries, 2 copies. [V. Ya. Levashova, 1956, p. 32, fig. 8, 1, 3]; Moscow, 14th-16th century layers, 2 copies. [Rabynovych M.G., 1954, fig. on the village 77; 1955, p. 82, fig. 28, 1]; accidental find in the village Pekoza in the Gorky region. [G.A. Arkhipov, 1973, fig. 76, 6]; Belhorod Kursk, XVI-XVII centuries. [A. V. Nikitin, 1962, fig. 6, 1]; Bulgarian settlement in the Tatar ASSR, 13th-14th century layer; Aga-Bazar settlement on the outskirts of the Bulgarian hillfort, XIII-XIV centuries. [State Museum of the Tatar ASSR]; an accidental find from the territory of the Tatar ASSR [State Museum of the Tatar ASSR]; the origin and dating of one tip, which is kept in the GYM, are unknown.

Divich-hora settlement in Chernihiv region, XI-XIII centuries, 2 copies. [V.Y. Dovzhenok, 1961, p. 40, 41, fig. 15]; Knyazha Gora settlement in the Cherkasy region, XI-XIII centuries, 4 copies. [Belyashevsky Ya., 1892, p. 32, 33; V.Y. Dovzhenok, 1961, p. 39, fig. 14; Kyiv State University and Kyiv State Historical Museum]; Kolodyazhyn settlement in Zhytomyr Region, XI-XIII centuries, 2 copies. [V.Y. Dovzhenok, 1961, p. 42, 44, fig. 7; funds of the Institute of Archeology of the Academy of Sciences of the Ukrainian SSR]; Raikovets settlement in Zhytomyr region, XI-early XIII century, 6 copies. [VK Goncharov, 1950, p. 144-146; V.Y. Dovzhenok, 1961, p. 41-43, fig. 16; Zhytomyr Museum of Local Lore; GE]; the village of Slobidka in the Oryol region, XI-XIII centuries, 2 note. [funds of the Academy of Sciences of the USSR from the excavations of T.M. Nikolskaya]; Seren settlement in the Kaluga region, XI-XIII centuries. (Nikolskaya T.V., 1967, p. 53; GYM); Bila Tserkva, XI-XIII centuries, 25 copies. (collections of the LoIA and GE from the excavations of M.K. Karger); Vyshhorod Ryazanskyi, XIII-XIV centuries [Ryazan Regional Museum of Local Lore]; the outskirts of Kyiv, an accidental find [Chernetsov A., 1972, fig. 9, 5]; Old Orhei, Moldavian SSR, a hoard of agricultural tools (measured 2 copies from the funds of the Institute of History of the Academy of Moldavian SSR); settlement of Suceava in the Moldavian SSR, 15th-16th centuries [P. Byrnya, 1969, pp. 150-152, fig. 29].

Hulash settlement in the Tatar ASSR, XI-XIII centuries. [Smirnov A.P., Kakhovsky V.F., 1972, p. 65; State Museum of the Chuvash ASSR]; Murom town settlement in the Kuibyshev region, XI-XIII centuries. [Matveeva G.I., 1974].

Bulgarian settlement in the Tatar ASSR, excavation VIII, layer XIII-XIV centuries. [GYM].

Random finds on the territory of the Tatar ASSR, presumably related to Bulgarian time, 18 copies. [Shtukenberg A., 1896, p. 211 et seq.; Kiryanov A.V., 1955, fig. 3, 1, 2; N.A. Khalikov, 1981, fig. 5, 2, 3, 5, 6; State Museum of

the Chuvash ASSR; GBM; National Museum of Finland in Helsinki].

S. Rozhdestvenske col. Perm province, accidental find [A.A. Spitsyn, 1902, tab. XXX, 7].

Accidental finds near the village. Chazevoy and in the Verkh-Invenska volost, coll. Perm province. [A.A. Spitsyn, 1902, tab. XXX, 11, 12].

Vyshgorod village in the Ryazan region, XIII or XIII-XIV centuries, 2 notes. [Ryazan regional local history museum] ; Pron settlement in the Ryazan region, XIV-XVI centuries. [Ryazan regional local history museum]; Bila Tserkva, XII-XIV centuries. (?) (Bilotserk Museum of Local Lore); Komarivka in the Kyiv region, XIV century. [O.V. Chernetsov, 1972].

Old Orhei in the Moldavian ASSR, a hoard of agricultural tools [measured 2 approx. from the funds of the Institute of History of the Academy of Sciences of the Moldavian SSR].

Accidental finds on the territory of the Tatar ASSR, 3 notes. [Shtukenberg A., 1896, p. 214; State Museum of the Tatar ASSR]; Kirzhemany in the Mordovian ASSR treasure of agricultural tools, 2 notes. [A.V. Tsyarkin, 1969].

Bulgarian settlement in the Tatar ASSR, layer XIII, XIV century. [Department of Archeology of Moscow State University]; random finds on the territory of the Tatar ASSR, 2 copies. [State Museum of the Tatar ASSR].

The settlement of Suceava in the 15th and 16th centuries. [N.N. Byrnya, 1969, fig. 29] and Poyanensha XVI XVII century. [Chernetsov A.V., 1972v, fig. 4. 9].

Manor near the hut. Dawn in the Krasnodar Territory, 1st century. BC - I century N. e., 2 copies [Krushkol Yu.S., 1971, p. 137, fig. 21, 22]; Semenivna settlement in the Crimea region. Ukrainian SSR, I-III centuries. N. e. [Kruglykova I. T., 1960, fig. 22, 1]; Anapa of the Krasnodar Territory (Gorgynpia), layers of the II-III centuries. N. e. [Kruglykova I. T., 1960, fig. 22, 1]; Anapa of the Krasnodar Territory (Gorgynpia), layers of the II-III centuries. N. e., 2 copies Anapa Branch of the Krasnodar Historical and Archaeological

Reserve]; Batareyka-1 settlement, I st. N. e. [Sokolsky N.I., 1963, p. 188, fig. 7, 1]. The last copy is fragmented and is not included in Appendix 1.

Burial ground of III Vaytsar and Sunalkia, I III century. [Antoniewicz J., 1963, p. 11].

The Raikovets settlement of the 11th and early 13th centuries. in Zhytomyr region, 2 copies. [VK Goncharov 1950, tab. V, in, 7]; Shchuchip settlement of the 11th and 13th centuries. [V.Y. Dovzhenok, 1967, fig. 12].

An accidental find in the vicinity of the village. Oleksiivske, Kuibyshev district, Tatar ASSR, probably originating from the territory of the pre-Mongol village of Oleksiivske (kept in the school museum of the village of Oleksiivske); an accidental find on the territory of the Tatar ASSR [State Museum of the Tatar ASSR].

Chernyakhiv settlements of Lopatna in the Moldavian SSR, Hrytsivtsi in the Ternopil region, Renniv in the Lviv region. [Braichevsky M.Yu., 1964, p. 37]; Lviv State Historical Museum); Khotomel hillfort in the Brest region, 8th and 9th centuries. [Kukharenko Yu.V.. 1957, p. 94, 95, fig. 35]; The right-bank Tsimlyan settlement, VIII-IX centuries, 3 copies. [S.A. Pletneva, 1968, fig. 38, 10; GE]; [I.Y. Lyapushkin, 1950. fig. 5]; Bila Tserkva, XI XIII century. (Bilotserk Museum of Local Lore); military dam settlement in the Poltava region, 11th and 13th centuries; Divich-hora settlement in the Cherkasy region, XI-XIII centuries. [V.Y. Dovzhenok, 1961, p. 254, fig. 15, 2]; Yekymaut settlement in the Moldavian SSR, 9th and 11th centuries. [Fedorov GB; 1954, fig. 52, 2]; Izyaslavl, XI XIII century, 32 copies. [funds LOYN AN of the USSR and GE from the excavations of M.K. Kargera]; Knyazha Gora settlement in the Cherkasy region, XI XIII century, 3 copies. [V.Y. Dovzhenok, 1961, p. 255, fig. 14, 5]; [Kyiv State Historical Museum]; Plisnensk settlement in the Lviv region, 11th - 13th century, 3 copies. [VK Goncharov, 1950, tab. IV, V]; Vyshgorod village in the Ryazan region, XII-XIII centuries. (?) [Mongait A.L., 1961, p. 259; Levashova V.P., 1956, Eastern Europe. 6, 1]; Suzdal, layer XII-XIV

centuries. [V.P. Levashova, 1956, p. 32]; with. Klychanovo, Transcarpathian region, accidental find [Uzhgorod Museum of Local Lore]; Muran cemetery in the Kuibyshev region, XIII-XIV centuries. [V.P. Levashova, 1956, p. 33]; Hulash settlement in the Tatar ASSR, XI-XIII centuries, 3 note. (Kakhovsky V.F., Smirnov A.P., 1972, p. 65); [State Museum of the Chuvash ASSR]; Bulgarian settlement in the Tatar ASSR, layer of the 14th century [State Museum of the Tatar ASSR]; random finds in various districts of the Tatar ASSR ASSR, which probably belong to Bulgarian times [A.V. Kiryanov, 1955, Figs. 3, 3, 4]; [State Museum of the Tatar ASSR]; Old Orhei in the Moldavian SSR, a treasure of agricultural tools of the XIV-XVI centuries. 5 ex. [funds of the Institute of History, funds of the Academy of Sciences of the Moldavian SSR]; Kirzhemany in the Mordovian ASSR, a treasure of agricultural tools, no earlier than the 14th-16th centuries, 3 copies. [A.V. Tsyarkin, 1969].

CHAPTER 3
MANAGEMENT OF EVOLUTION OF ARROW TOOLS
IN EASTERN EUROPE

Rala, which is known in Eastern Europe according to ethnographic data, is the result of a centuries-old development, the early stages of which we have to find out. Therefore, it is advisable to start research with these materials.

In the second half of the XVIII-XIX centuries, rales were known in certain regions of Ukraine (Crimea and Polissia), Moldova, and the Baltic States. In the European North, a single-toothed Cherkusha was used in some places, which D.K. Zelenin brought it closer to the ral both in terms of functional purpose and construction [Zelenin D., 1907, p. 17, 20]. In this period, harrows act primarily as auxiliary tools, intended for secondary plowing of soil already raised by a plow or a plow, as well as after harvesting potatoes, hemp, and vegetable crops. Only in North-Western Estonia and in some places in the poor farms of Ukraine and Moldavia was plowed as early as the 19th century. were used for primary tillage. Ethnographic data, thus, paint a picture of the completion of the process of displacement of ral by other, more productive tools. However, in many areas, traditions about the former use of ral as the main tillage tools were preserved [Mamonov V.S., 1952, p. 77].

According to the structure of the working part and, therefore, agrotechnical possibilities, it is customary to distinguish plows without tracks, in which the plow is at a significant angle to the soil, tracked or sole, in which the working part is in a position close to horizontal, as well as tools with a variable angle of inclination of the working part [V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi, 1971, p. 33-36]. The trackless plow loosened the soil only with the end of the plowshare, due to which the roots of weeds were badly destroyed, and between the furrows, strips of land remained untouched by the tool, plowed

shallowly, and was unstable during movement. However, trackless plows are flexible and easily change the plowing depth. It was possible to successfully work with them on clogged, as well as low-capacity soils, where excessive plowing depth is harmful. Furrows formed by a plow with a skid were, as a rule, wider and deeper; trimmed the soil layer from below, such a plow destroyed the roots of weeds better, was more stable during movement, did not leave significant strips of unplowed land between the furrows. Plows with a skid gave the greatest effect when working on lands with a deep arable layer, relatively homogeneous, such that there are no extraneous inclusions. Thus, each of the considered species had its advantages and disadvantages, its field of application, which explains their parallel existence. Plows with a variable angle of installation of the working body (that is, a variable angle between the harrow and the ploughshare) combined some positive qualities of tracked and trackless plows.

According to the structure of the body (skeleton or skeleton) among Eastern European "ethnographic" rales, several stable types can be distinguished. Type 1 – with one handle, a straight shaft with a stand between the shaft and the plow (Fig. 42, 1, 2; 43, 4). They were made of three main parts: a ploughman's handle, which had a bent structure, a straight shaft and a rack. Depending on the degree of curvature of the plough-handle design, the working part, which was 0.55 to 0.80 m long and 9-11 cm wide, could be placed at a greater or lesser angle to the ground, often forming a skid. It was used with and without iron shells. In the first case, the cross-section of the front end of the plow was semi-oval or ellipsoidal, in the second it had the form of an elongated triangle or was flattened. Plows with a flattened cross-section of the front end of the ploughshare could work only on soft soils, with a subtriangular one - on various, in particular, hard ones. The same differences in the cross-section of the front end of the plow are observed in other types of plows.

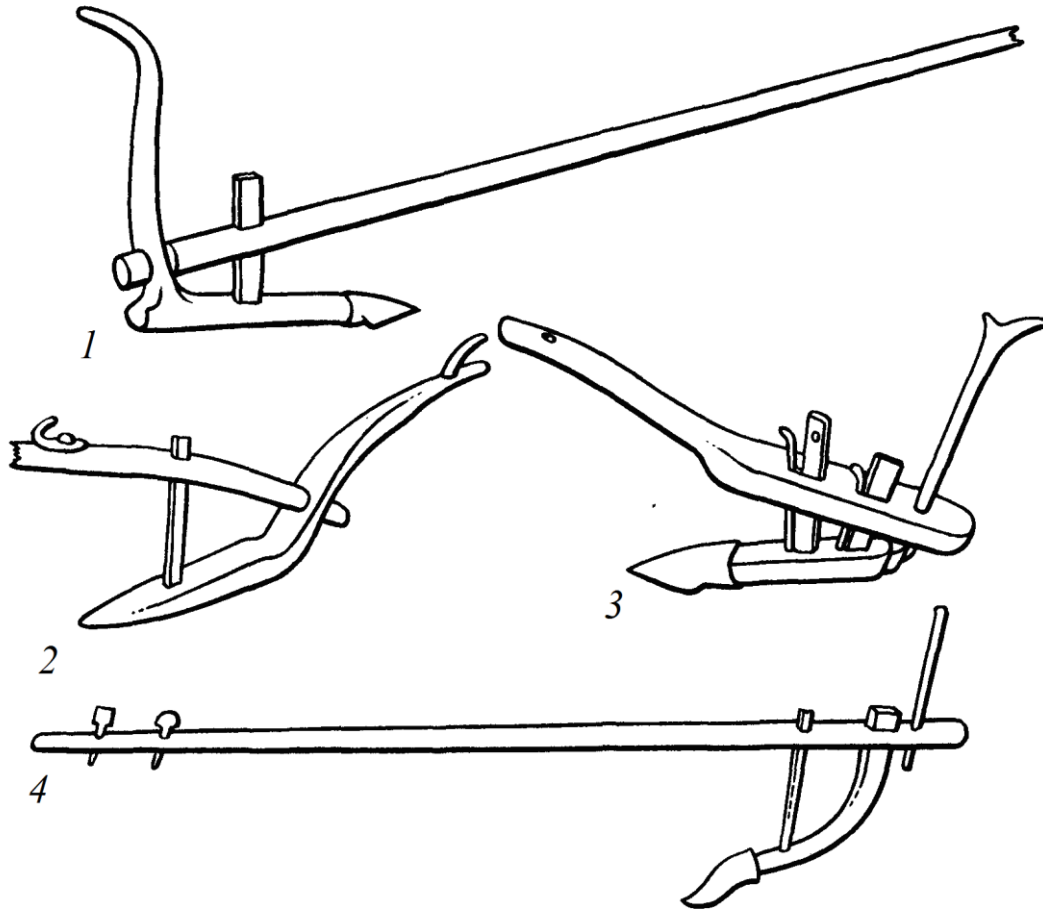


Fig. 42. Rala from different regions of Ukraine (according to V.S. Mamonov, V.F. Horlenk, I.D. Boyk, O.S. Kunitsky)

Type 1 plows were used in Ukraine [Mamonov V.S., 1952, p. 74-76, fig. 21; Gorlenko V.F., Boyko I.D., Kunitskyi O.S., 1971, p. 34-36, tab. II, 2-4], in Moldova [Demchenko N.D., 1968, fig. 8], Crimea [Haudricourt AG, Delamarre M. JB., 1955, fig. 63], Estonia [Feoktistova L. X., 1980, fig. 12, 2]. In Ukraine, they were both trackless and with a skid, in Moldova and Crimea only skids are known, in Estonia - only without a skid.

Type 2 – single-arm plows with a straight plow share with a four-element design (Fig. 43, 2). They were made of four main parts: the working part, which consisted of a slide 0.5-0.75 m long and a handle, a straight beam, which was fixed with the rear end in the handle approximately in the middle of its height, and a stand between the slide and the beam. Their track was slightly wider than

that of type 1 skid steers, narrowing significantly in the front part. They were used with wide-bladed naralniks, which were sometimes replaced by a forging of the front end of the skid. They were recorded only in Moldavia, where they were often provided with double-sided falling boards [Pamfile T., 1917, p. 79; Demchenko M. D., 1968, fig. 2], and the former Zaslavl district [Leser R., 1931, fig. 89].

Type 3 – with a straight shaft and a plow that was inserted into the shaft from below (Fig. 1, 1, 2; 42, 4; 43, 3; 44, 2). They were also made from four main parts, but the method of their connection was different: the plow was inserted from below into the rear part of the massive shaft, and the handle was installed behind it. Sometimes the handles were bent upwards at the rear part of the beam. There was a rack between the harrow and the tiller.

Plows of this design are known in two varieties: with a straight and bent ploughshare. The first (Fig. 1, 7; 43, 3; 44, 2) were widespread in Ukraine and Lithuania. Latvia and places in Estonia [Güldenstedt A., 1804, tab. 1; D. Zelenin, 1907, p. 18,153; Moszynski K., 1929, fig. 108, 129; Feoktistova L. X., 1980, fig. 10; 12, 1]; the plow was located in them at an angle of 40-45° to the shaft, in most cases it did not have an iron tip. A plow with a curved plowshare (Fig. 1, 2, 42, 4), which is often forms a slide, recorded only in Ukraine [Mamonov V.S., 1952, fig. 8; Gorlenko V.F., Boyko I.D., Kunytskyi O.S. 1971, tab. II, 1, 6]. It is possible that the same type in its variety with a straight blade belongs to the one-toothed Cherkusha [Zelenin D., 1907, p. 25, 26, 148; V.S. Mamonov, 1952, p. 87].

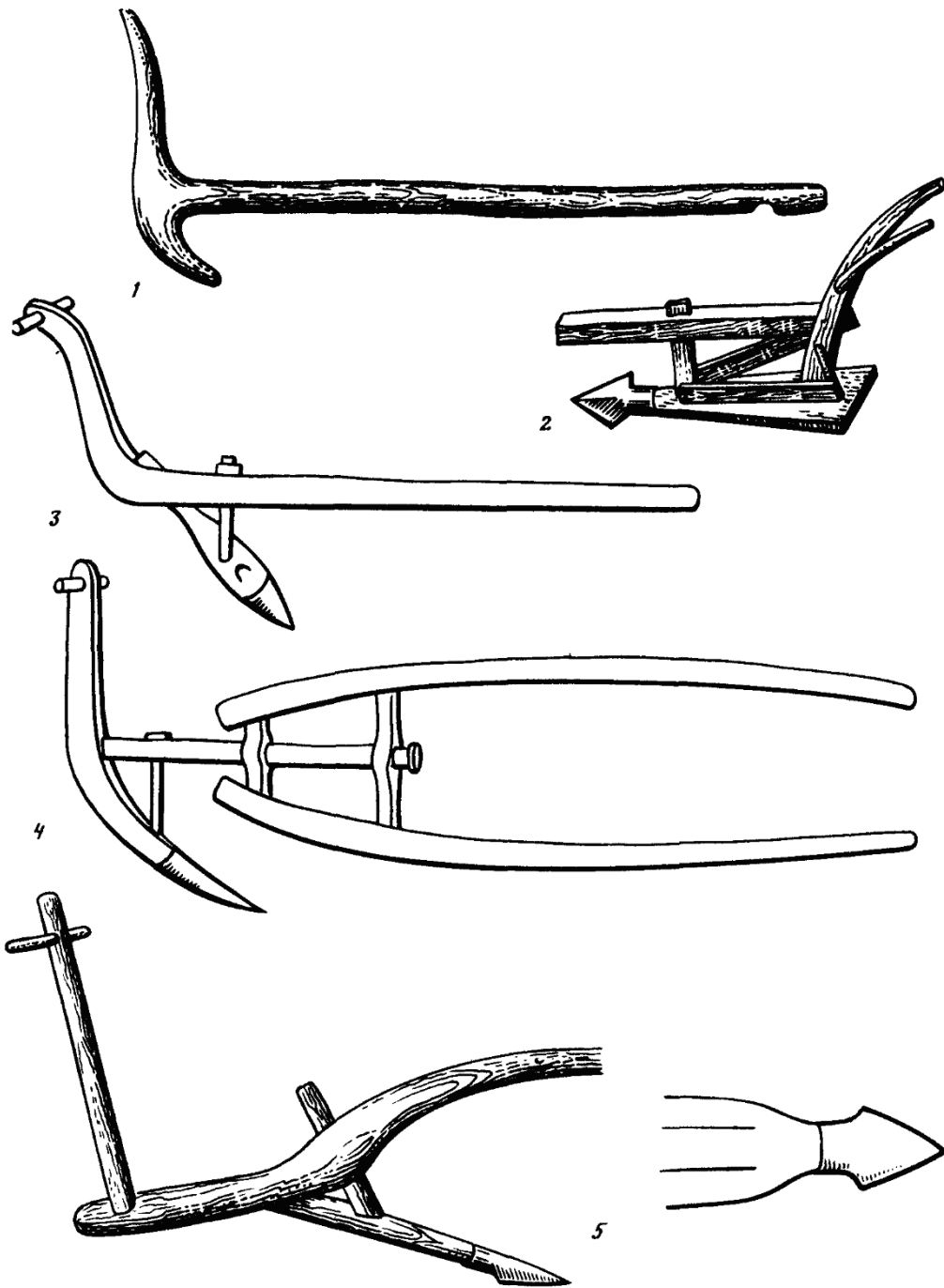


Fig. 43. Rala from various regions of the European part of the former Eastern Europe:

1 – Polissia of Ukraine, according to Parfyonov's description; 2 – Moldova, according to N.D. Demchenko; 3, 4 – Estonia, according to L.X. Feoktistova; 5 – Polissya, after K. Moshchinsky

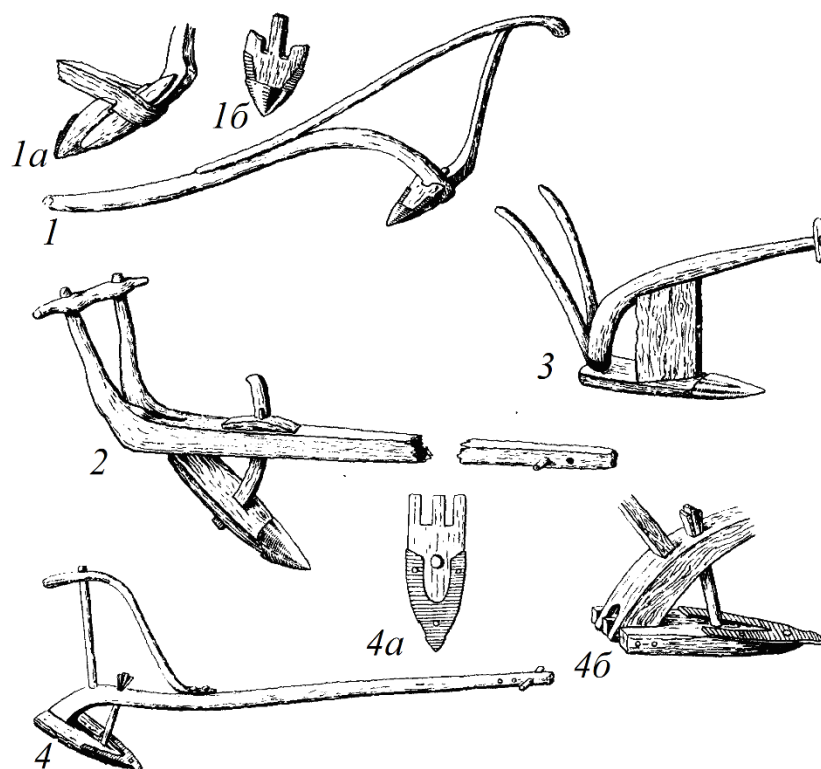


Fig. 44. Rala from Estonia (1, 2, 4) according to L.X. Feoktistova and Polissya (3) according to K. Moshchinsky

Type 4a plow with a straight share, which had a share, which was connected to the share with the help of two racks (Fig. 42, 3). They were made of five separate parts: a beam, a tiller up to 1.12 m long, a handle and two racks: a long front one and a short rear one. By changing the position of the front rack, it was possible to change the angle of inclination of the working part within significant limits - from a position close to horizontal to 30° - 40° . They were provided with broad-bladed divers. Known only in Ukraine [Mamonov V.S., 1952, fig. 9-11; Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, tab. II, 5, 6].

Type 5- plow with a straight share (Fig. 43.1). They were made from a single piece of wood in such a way that a part of the trunk served as a scythe, and a thick and strong branch, which went to the side and was processed accordingly, as a plowshare. Sometimes another knot, in the opposite direction, served as a handle, sometimes the handle was attached. Known in Volyn

[Parfenov P., 1873, p. 640; V.S. Mamonov, 1952, p. 87, 88, fig. 26; Kovalsky M.P., 1963, p. 180, 181], in Belarus, where they were called bipods [A.K. Serzhputovsky, 1910, fig. 4], in some areas of Estonia [Moora A., 1956, p. 281, 282, fig. 82, 7; Feoktistova L.X., 1980, p. 123, 124], as well as in the north of Moldova [N. D. Demchenko, 1968, p. 47-49].

Type 6 – slide plows with a curved share. They had a slide made of a separate part, a curved shaft, sometimes a rack between the shaft and the slide. The handle of such tools was attached. Recorded in the Belarusian Polissia and Estonia. Polish plows (Fig. 44, 3) had a short shaft, one or two handles, as well as a stand called a bipod, were small in size, had a small narrow-bladed ploughshare or an iron forging of the front part of the slide, were used for turning potatoes [Moszynski K., 1929, Fig. 121]. Rala from Estonia (Fig. 44, 4) was used for primary plowing [Feoktistova L. X., 1980, p. 48, 49, fig. 5-7], differed in larger sizes and the fact that the shaft was fixed in a special cutout of the rear end of the skid, and the angle between them could vary within small limits. The handle was inserted into the rear end of the beam. Due to the location of the connection point of the shaft and the working part near the end of the last skid, during operation it did not occupy a strictly horizontal position, but moved at some angle to the ground. They were used both with iron shells and without them. In the old ethnographic literature they are called "pig's snout" [Schweinnase], in the modern one - Saaremaa rals.

Type 7 – a plow with a curved share and a straight share, which was inserted into the share from below (Fig. 43, 5). They were made of four parts: a beam, curved in the initial part, a straight plow, which was inserted into the beam at a small angle to the ground, a rack and a handle attached to the rear end of the beam. Close to the first variety of type 3, differing in the curvature of the shaft. They were provided with broad-bladed divers. Recorded in Western Volyn and adjacent areas of Poland [Moszynski K., 1929, fig. 124, 125, map 4].

Type 8 – plow with a curved shaft and one handle (Fig. 44, 1). The basis

of the tool was a one-piece knee-shaped curved design of the handle, which was inserted into a through hole in the rear end of a massive, strongly curved shaft. In the same hole, a small shovel-shaped plow was attached, the edges of which were bound with iron. Recorded in Estonia, mainly on Rukhnu Island, they are therefore called Rukhnu rales [Feoktistova L.X., 1980, p. 49 - 50, fig. 8, 9].

Analysis of the structure and methods of application of Eastern European "ethnographic" rals allows us to draw several important conclusions.

First, it turns out that most of their types are characteristic not only of this territory, but also occur throughout Europe and even beyond. These are types 1, 2, 5, 6 and 8 [see, for example: Moszynski K., 1929, fig. 131, 133, 137, 138; Leser R., 1931, fig. 49, 50, 124, 127, 141, 142; Haudricourt AG, Delamarre M. J.-B., 1955, fig. 36, 73, 87, 89; Krasnov Yu.A., 1975, maps fig. 22, 35, 51]. Only rales of types 3 and 4 are characteristic mainly of eastern Europe, and rales of type 7, as noted, generally have a very limited range. Obviously, the development of rural areas in the east and west of Europe was largely the same. In this regard, we note that in Central and Western Europe, ethnographic plows of types 1, 2, and 6 often had double-sided shelves (Fig. 45, 1-2, 4-6) and combs, and the first two types had a wheel front. Performing the functions of the main plowing tools, they replaced the plow to some extent. It is possible that in some period Eastern European plowshares of certain types, being the main plowing tools, could be used with such devices.

Secondly, interesting data on comparative working qualities and areas of application of types of rala. Type 1 plows were the most suitable for plowing various soils, in particular fallows and even virgin lands [Mamonov V.S., 1952, p. 76]. Plows of type 2, as well as types 1 and 6 with a long skid turn out to be the most effective on old arable soils with a deep arable layer [Novikov Yu.F., 1963, p. 108-110]. Plows of type 3 in their variety with a straight plow are well suited for working on lands with a shallow arable layer, as well as littered with stones and tree roots [Novikov Y.F., 1963, p. 105; 1964, p. 3-4]. Similar

qualities are possessed by types 5 and 8 [Feoktistova L.X., 1980, p. 50, 59]. Mud plow 3 with a curved plowshare, as well as types 4 and 7, were used exclusively for secondary plowing [Moszynski K., 1928, p. 256; V.S. Mamontov, 1952, p. 76].

All this gives reason to divide Eastern European "ethnographic" tools into four groups according to the scope of their predominant use: 1) adapted to work in different conditions – type 1; 2) adapted mainly for primary plowing of old arable soils - type 1 in its variety with a long horizontal skid, type 2, type 6 in its variety with a long skid; 3) adapted to work on soils with a thin arable layer, in particular those clogged with stones and roots, type 3 in the variety with a direct plow, type 5, type 6 in the Estonian variety, type 8; 4) adapted for secondary plowing – type 3 in the variety with a bent ploughshare, Polish variety of type 6, type 7. The tools of the first group are recorded in different natural and geographical zones. The tools of the second group are known only in the steppe, forest-steppe and on the southern outskirts of the forest zone. The tools of the third group are characteristic of the forest zone, but they are also found in the forest-steppe. The distribution of the rals of the fourth group coincides with the range of plow-type tools - actually the plow and the horn plow.

From the point of view of the structure of the hull, types 2, 3 and 4 can be considered genetically related to type 1 and, therefore, later. The plow with a four-element design (type 2) should be considered as a direct modification of the plow of type 1 with a horizontal slide: the integral design of the handle-plow seems to break up here into two independent parts - the slide, which can now be arranged wider, because its width is not connected to the cross-section of the handle, as in type 1, and the handle. A plow with a straight plow, inserted into the harrow from below (the first variety of type 3), can be considered as the same modification of a plow of type 1 with the working part placed at an angle to the soil. The second type of ral type 3 can be interpreted as a modification following the first variety of this type, and the rales, in which the working part is

attached to the share with the help of two racks (type 4), as a further development of the ral type 3 as a whole. The reconstructed evolution finds its explanation in the predominant spheres of application of tools: the development goes from a universal tool (type 1), on the one hand, to tools designed for work on low-power uncultivated soils (the first variety of type 3), on the other hand, to tools adapted for works on cultivated soils with a strong cultural layer (type 2), and then – to tools that were used mainly for secondary plowing (the second variety of type 3 and type 4).

Ethnographic material shows, after all, that plows with a straight shaft and one handle (type 1) and genetically related types 3 and 4 were the most widespread in Eastern Europe. The main range of plows with one handle (type 8) and four-element plows construction (type 2) was located further west.

Archaeological finds of rales and their ancient images are rare in the considered territory. The earliest are the images of such tools on the Simferopol ceiling, finds of ral in the mounds "Vysoka Mogila" and near the village of Verkhnya Mayivka, as well as in the peatland near the village. Forested

The Simferopol stele was discovered by N.JI. Ernst during the excavation of mound No. 1 in the Bakhchi-Eli tract near Simferopol [Ernst N. L., 1930, p. 76-79; Tallgren A. M., 1926, p. 49, fig. 36B, 6], dates back to the Catacomb period (the end of the 3rd - the first half of the 2nd millennium BC). The mound in which it was found belongs to the nearby catacomb Kemi-Obin culture [Formozov A.A., 1958, p. 138, 139; Shchepinsky A.A., 1963, p. 39].

Many authors interpreted the drawings of the Simferopol stele. For the first time, the image of plowing tools on the front side of the stele was pointed out by X. Kothe [N. Kothe, 1953a, p. 51; 1956, p. 83-86], then - B.A. Shramko [Shramko B.A., 1964], who highlighted, in addition, images of hoes, pickaxes, and a pair of yoked oxen. He suggested that the ceiling depicts "a cult scene of preparation for plowing, which was supposed to magically contribute to obtaining a good harvest, increase the fertility of the fields. Therefore, tools

related to agricultural work are depicted, but not shown in action" [Shramko B A., 1964, p. 90].

Such circumstances compel us to consider the drawings of the Simferopol stele that interest us (Fig. 46, 1, 2), precisely as the image of the plow. First, they can receive a meaningful interpretation only when compared with plowing tools known from ethnographic data, and with a certain type of them (Fig. 46, 3, 4). Secondly, these images are similar to rock paintings from Northern Italy, where plowing tools are presented in the process of work and where such an interpretation of the images does not cause doubts [Glob PV, 1954]. The fact that on the Simferopol ceiling the chariots are shown without the animals harnessed to them, and the people depicted next to them are not holding the handles of weapons, should not confuse us. The explanation of this is given by B.A. Shramko and given above. In addition, not all petroglyphs of plowing tools depicted harness animals [see, for example: Baltzer L., 1881-1882, vol. I, fig. 1; vol. II, fig. 7, 23]; in some images, the plowman does not hold the plow handle [Glob PV, 1954, fig. 1, 2]; individual scenes do not contain images of a plowman at all [Glob PV, 1951, fig. 127; 1954, fig. 4, 5, 7].

Images of plowing tools on the Simferopol ceiling contain enough information to reconstruct their appearance. The basis of the plow, obviously, was the one-piece design of the plow handle, with a sharp bend at the bottom, which forms a short wedge-shaped slide. During work, it could not occupy a strictly horizontal position: its small length in combination with a short shaft and a relatively high place of application of the traction force led to the fact that the heel of the slide rose slightly during movement. In the upper part of the structure of the ploughman's handle, the handle with which the ploughman controlled the implement is shown. In one case, the handle protrudes from both sides of this structure and apparently represented a bar attached to its upper part perpendicular to the movement of the tool, so that it could be grasped with two hands during operation. In another image, the handle is shown in the form of a

sharp bend back of the upper part of the tiller handle. A short straight shaft was inserted into the hole made in the design of the plow handle about the middle of its height, which was probably fixed with wedges. Both images clearly show the rear end of the boom protruding behind the tiller handle structure. There were no racks between the shaft and the tool. The discussed plows were probably used in a pair harness.

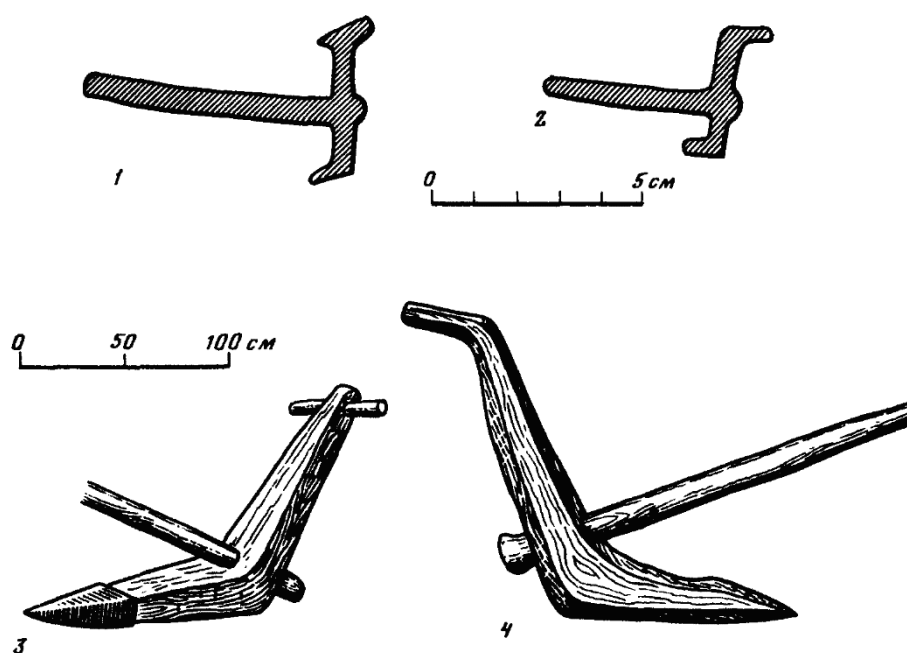


Fig. 46. Images of the ral Simferopol stele and their closest ethnographic parallels

1, 2 – Simferopol stele; 3 – Kafiristan, according to I. Brentjesa;

4 – Bepgalia, according to E. Verta

It can be assumed that these plows differed in their small size, easily went into the ground and easily came out of it. It was possible to prevent the involuntary release of the plow from the soil only by constant pressure on the handle from above, which made it difficult for the plowman to work. A small skid made it possible to cultivate the soil only to the minimum depth necessary to cover the seeds. Of course, there were no police devices in such rales. From a

functional point of view, they should be considered as primitive tools for the formation of furrows. From the point of view of design, they belong to the ral with a straight shaft and one handle in their variety with a short slide and without a rack.

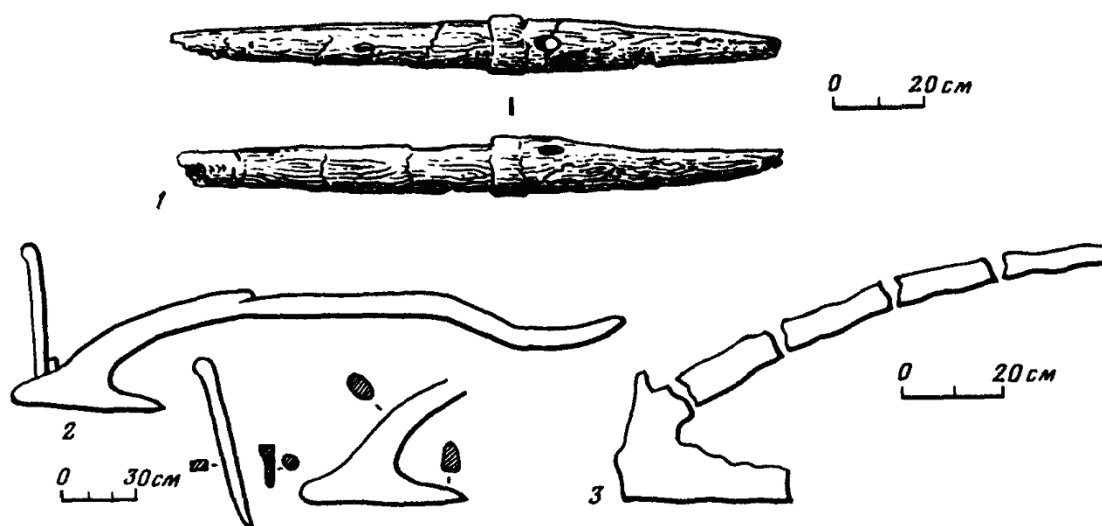


Fig. 47. Ancient rales and their fragments

1 - from the mound "High Grave"; 2 - from a peat bog near the village. Polissya;
3 - from the mound near the village. Verkhnya Mayivka

A fragment similar in structure to the ral was found in the mound "Vysoka Mogila" in the village of Beams of the Vasytkiv district of the Zaporizhzhya region, in a burial attributed to the late stage of the pit culture and dated to the end of the 3rd-beginning of the 2nd millennium BC. [Bydzyla V.Y., Yakovenko E.V., 1973].

The ral fragment (Fig. 47, 1) is a massive, rounded cross-section and arcuately curved in the longitudinal cross-section ash beam, badly damaged by rotting. Its upper and lower ends are fragmented, the length of the preserved part is 82 cm, the diameter of the upper part of the beam is about 6 cm. Its lower part is slightly curved and has a diameter of 7 cm. The transition from the upper part

to the lower part is made in the form of a coupling-like expansion, located approximately in the middle of the preserved part instrument. A little lower there is a through hole of a rounded shape with a diameter of about 4 cm, in the area of which the side of the beam facing the direction of the bend of the lower part is slightly flattened; the lower part has traces of sharpening.

The shape, dimensions, and proportions of this object make it possible to interpret it as a plow handle of a light plow with a straight shaft and one handle, which belonged to a variety characterized by the placement of the working part at a significant angle to the ground and the absence of a stand.

The relatively high location of the hole in which it was fixed, as well as the angle at which this hole was made in the design of the handle-rarler, testify to the fact that the unpreserved shaft of this tool was exactly straight. Some doubt in this interpretation of the find may be caused by the small diameter of the hole. The dimensions of the part under consideration may have changed due to drying and related deformations. However, a similar diameter of the shaft was recorded in some light rales of the same type, known from ethnographic data [Marinov V., 1963, p. 570, fig. 1, 2]. It is possible that the additional fastening of the boom in the desired position could be carried out with the help of a soft connection, one end of which was fixed on the handle structure above the mentioned coupling-like extension, and the other - on the rear end of the boom. This kind of fastening, soft or hard, is known in some rales according to ethnographic data [Y. A. Krasnov, 1975, fig. 23, 1, 6, 7; 24, 3].

Like the plows depicted on the Simferopol ceiling, the tool under consideration should be considered a very primitive furrow-forming plow. It could form furrows with a width of no more than 5-6 cm. In the absence of a stand, the oldest plows with a straight shaft and one plow handle were very weak and could only work on soft, moderately moistened soils, devoid of continuous grass cover. The use of such tools on other soils required preliminary processing with hand tools, which was not uncommon at the dawn of arable

farming [Savelyeva T.N., 1962, p. 58-60; Kramer S.N., 1965, p. 78-85; Salonen A., 1968, p. 121, 123].

Plow, found near the village. Polissia (Zhabchychi) in Chernihiv region. [Shramko B.A., 1964, 1969], was discovered at the bottom of a peat bog, at a depth of 1.5-1.6 m. The stratigraphy of the peat bog testifies to the undisturbed nature of the layer that covered the find, and to the considerable antiquity of the plow. According to ceramics found near the find, it was originally dated to the end of the Bronze Age - the beginning of the early Iron Age. The later radiocarbon analysis of peat samples from the lower layers of the peatland, which began to form after the plow fell to the bottom of the ancient reservoir, gave a date of 3340 ± 80 years to the present day, i.e. XIV-XIII centuries. to n. e. [Shramko B. A., 1969, p. 144].

Poliske ralo (Fig. 47, 2) from a constructive point of view differs sharply from those described above. It was made of oak in such a way that part of the trunk formed a plow, and the branch departing from it was a screed. The field has been preserved quite well. Its total length from the rear end of the plow to the front end of the share is about 2.7 m. The length of the plow, which moves during operation in a close to horizontal position and thus forms a skid about 62 cm long, and its greatest width and height in the middle part – about 10 cm. In the longitudinal section, the skid is wedge-shaped, the cross section of its front part is subtriangular. The sole of the skid is slightly concave and highly polished by friction against the ground, as is its front end. The slide turns into a shaft approximately in the middle of its length. A square hole for the handle is made close to the base of the shaft behind it. The shaft is hewn on both sides, moderately curved in the initial part. Its front end is slightly bent to the left of the longitudinal axis of the slide. The shaft has no holes for attachment to the yoke, although, apparently, it has been preserved to its full length. Probably, he was simply attached to the yoke, which should be considered a very archaic

feature. The only attached part of the rifle is the handle, about 65 cm long. The tool has no traces of use of the metal scabbard.

The unification of the hryadyl and the plowshare, as well as the curved hryadyl, make it possible to attribute the Polish ploughshare to the type of crook-hryadyl harrows, not represented in the Eastern European ethnographic material, but known in the recent past in other regions of Europe, which have a greater antiquity [Krasnov Yu.A., 1975, p. 108-144]. Within this type, varieties are distinguished, the criterion for which can be the location of the place of transition of the beam into the slide and the location of the handle in relation to the base of the beam. These features characterize the ratio of the center of gravity and the point of application of the traction force, which largely determines the working qualities and possible areas of application of ralo. Using, with minor changes, the classification of slatted and curved rales proposed by B.A. Shramko [Shramko B.A., 1964, p. 90, 91], we single out the following varieties among plowshares of the considered type: 1) plowshare with a short slide, in which the point of transition of the shaft into the slide is at the rear end of the latter, and the handle passes through the base of the shaft; 2) a plow with a relatively short skid, in which the place of transition of the beam into the skid is located near the rear end of the latter, and the handle is attached to the skid close to the base of the skid; 3) a plow with a short or long skid, in which the point of transition of the beam into the skid is near the rear end of the latter, and the handle is attached to the skid close to the base of the skid; 3) a plow with a short or long skid, in which the place of transition of the beam into the skid is in the middle of the latter or slightly shifted back, and the handle is attached to the skid close to the base of the skid; 4) a plow with a long skid, in which the point of transition of the beam into the skid is in the middle of the latter or slightly shifted forward, and the handle is installed at the rear end of the skid so that there is a significant space between the base of the skid and the place of attachment of the handle.

Archaeological and ancient iconographic materials make it possible to talk about the different times of appearance of these varieties [Y.A. Krasnov, 1975, p. 108-138]. The first two are recorded from the end of the III-beginning of the II millennium BC. e., the third can be dated from the first half or middle of the II millennium BC. e., the fourth is known from images and real finds no earlier than the beginning of the 1st millennium BC. e. Plow from a peat field in the village. Polissya belongs to the third of the specified varieties. Functionally, such plows appear to be more advanced than the earliest types of plows with a straight shaft and one handle. They had a high rigidity of the structure, a relatively long slide, a low location of the point of application of traction force. This made it possible to break up the soil from below, made the tool more stable on the move, and increased the plowing depth. Plows of this design could also work on relatively hard turfy soils [Y. A. Krasnov, 1975, p. 108, 109].

A plow with a crooked harrow has been preserved much worse than the Polish one, discovered in the male burial 4 of barrow I of barrow group XII near the village of Verkhnya Mayivka of the Dnipropetrovsk region, attributed to the catacomb culture [Kovaleva I.F., Volkovoy S.S., Marina Z.P., Lykhachev V.A., Poptsov V.A., 1977, p. 11, 12; Lykhachev V.A., 1982]. The working part and the shaft of the tool were fragmented in ancient times, the shaft rotted and fell into four pieces in the burial. The trees were very poorly preserved. The tool in question (Fig. 47, 3) differed from the Polish plowshare in that its shaft departs from the rear end of the plowshare, and the role of the handle was performed, presumably, by a natural shaft extending back from the beginning of the shaft. Even in ancient times, it was broken at the base. The length of the preserved part of the tiller is about 35 cm with the largest diameter of 15 cm, the shaft – about 1.2 m with a diameter of about 6-10 cm. The total length of the shaft was probably not less than 2-2.2 m, the shaft – 40-45 cm.

According to the general scheme of the construction of a plow from a mound near the village. Verkhnya Mayivka belongs to the first, the oldest type

of harrowed, crooked harrow. It is smaller than the plow, and is distinguished by its functional features: the location of the junction of the harrow and the harrow at the rear end of the latter meant that the working part during plowing moved at an angle to the soil, furrowing the ground only with the end of the harrow. In this way, it resembles the ral of the Simferopol stele, differing from them in the less rigid construction.

The considered finds of ancient rales and their images convincingly testify that at the end of the III-II millennium BC. e. arable agriculture has already spread in some areas of the south of Eastern Europe. The appearance of plowing tools in this period can also be indicated by some indirect data - the use of wheeled carts and the widespread use of sickles, which differ from earlier reaping knives³. These cultural phenomena should be considered as important elements of the economic and cultural type of arable farmers, which are not found in peoples who farm using only hand tools [Krasnov Yu.A., 1968, p. 4-11; 1971, p. 35-42].

Of great interest is a small clay model of a plow, found in the ruins in 1981 during the excavations of the eastern fortification of the well-known Belsky hillfort [Shramko B.A., 1984, p. 251-255]. It was discovered in a pit located not far from the previously opened sanctuary and behind ceramics dated to the end of the VI-V centuries. B.C. Together with it, fragments of a cart model, fragments of figurines of draft animals (bulls or oxen), cult models of grains and round loaves, and several anthropomorphic statuettes were found. According to the assumption of B.A. Shramko, this entire complex of clay sculptures was used during fertility cult rites.

The model (Fig. 48) depicts a crooked plow of the same design and construction as a peat plow near the village. Forested, but with a folded harrow. In the same pit, a clay object was discovered, which can be considered as a detail of the yoke model – its upper bar.

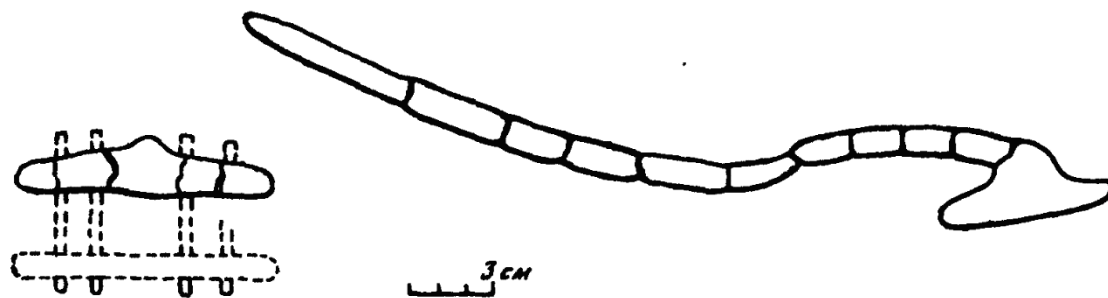


Fig. 48. Model of a plow and a yoke from the Biel settlement

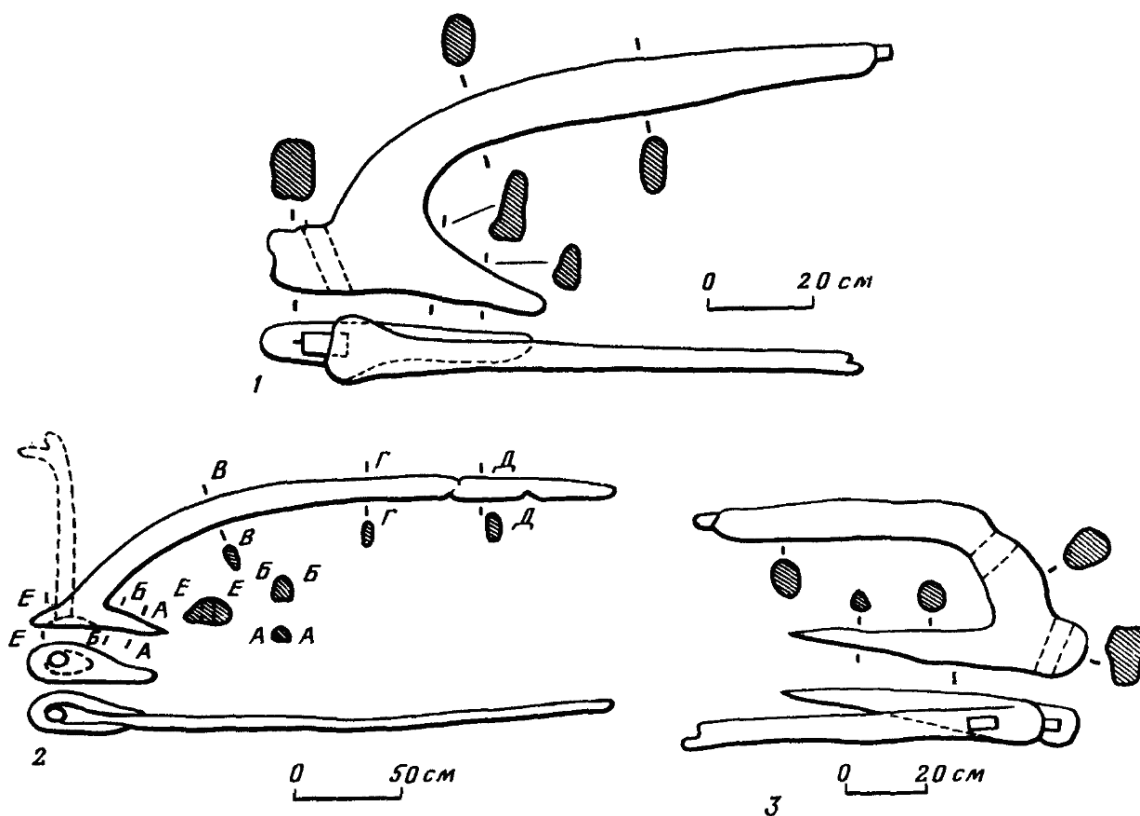


Fig. 49. Rala from the peatlands of Eastern Europe:
 1 – from the Serhiyiv peat bog; 2 – from Torovyshche near the village.
 Kaplanovichi; 3 – from Tokariv peat bog

Among other finds of ancient Eastern European rales, we note four more.

One of them comes from a peat bog near the village. Serhiivske in Starodub district, Bryansk region. (Fig. 49, 1), first published by V.Y. Dovzhenok, who dated it to the era of Kyivan Rus [V.Y. Dovzhenok, 1961, p. 68, 69, fig. 1]. B.A. Shramko, on the basis of the relative simplicity of the structure of the ral, some of its analogies, as well as finds of ceramics from the Scythian period near the peat bog, attributed the tool to the middle of the 1st millennium BC. e. [Shramko B. A., 1964].

The tool in question is similar in structure to the Polish rake: it is also made of oak and belongs to the same third type of curved-bladed rake. The plow has survived worse: the end of the shaft is broken off, the handle is missing. The length of the skid is less than that of the Polish ral, and is 53.5 cm. The rest of the measurements are similar. The shape of the cross-section of the front end of the skid is similar. There are no traces of the attachment of the iron tip to the tool. The length of the beam is unknown, as its front end is broken off. Directly behind the place of transition of the beam into the slide, a rectangular hole contained a handle slightly bent back. A feature of the plow is the massive rear end of the beam near its transition into the skid, which has a slight inward bend. According to B.A. Shramko, this form of it was created on purpose and made it possible to move the plowed land to one side. In this way, he considers the tool from the Serhiyiv peat bog as a kind of plow. However, it cannot be proven that the rear end of the boom was deliberately pressed. It is hardly possible to attribute to this simple tool, at least in its embryonic form, the functional features of a plow.

The dating of the Serhiiv Ral to the Early Iron Age is quite probable, but typological features do not allow us to insist only on this age. There are no more precise grounds for dating.

Another wooden harrow harrow of the same third variety was found in 1963 under accidental circumstances near the village of Kaplanovichi of Keletsky district of Minsk region [Pobol L.D., 1967]. In the vicinity of the

discovery site there are settlements of the beginning of the 1st millennium AD. and the era of Kyivan Rus.

The Kaplanovich plow (Fig. 49, 2) has been preserved quite well, only the attachment handle is missing. The total length of the tool from the heel of the skid to the front end of the slightly fragmented blade is 2.43 m, the length of the skid is 54 cm, the height of the greatest rise of the curved blade from the line, which is the continuation of the lower plane of the skid, is about 90 cm. In the rear part of the skid, close a round hole for the handle is made to the base of the shaft. The length from the front end of the skid to the center of the shaft at the point of its transition to the skid is 34 cm, the largest height of the skid is 11 cm, width 18 cm. Its lower side is slightly concave and has traces of being polished from rubbing against the ground, the front part in the longitudinal section is wedge-shaped, in transverse has a segmental shape. By this circumstance, as well as the shape of the hole for the handle, the greater width of the slide and the height of the shaft, the Kaplanovytsia plow differs from the Polis and Serhiyiv plows. Its shaft is strongly jammed from the sides. The working end of the slide has no obvious traces of attachment of the tip, but the shape of its cross-section does not exclude such a possibility. In general, the Kaplanovych ploughshare gives the impression of being later than the Polis and Sergiiv plough.

From the proposed L.D. Pobolem dating the Kaplanovyt'skyi rala to the beginning of the 1st millennium AD. e. you can agree. Some of its features are not found in rals firmly dated to the Bronze Age. According to indirect data, arable farming appeared on the territory of Belarus no earlier than the first centuries AD [Y.A. Krasnov, 1971, p. 45, 46], so the Kaplanovitsa plow can hardly be older. But the possibility of his later age cannot be ruled out.

The plow, found in 1921 in a peat bog near the village. Lathes in the Sumy region. (Fig. 49, 3), was repeatedly considered by researchers [D. Berezovets, 1952; Shramko B.O., 1965; Yu.O. Krasnov, 1975, 1981; Sramko V.O., 1973], but there are disagreements regarding its interpretation and

dating.

The general scheme of the design makes it possible to attribute the turning tool to the first type of curved-shaft rotary tools. However, his slide is not short, the handle was fixed in the slide, not in the shaft. The latter is broken in the front part. The distance from the point of fracture to the perpendicular, established from the back end of the skid, is 93 cm. The curve of the beam is interesting: at first it rises rather steeply, at an angle of 65-70°, rises up from the skid, then smoothly descends. Traces of a rectangular hole where it was broken are visible at the place where the beam was broken. In the initial part of the beam, at a height of 30 cm from the lower edge of the skid, there is another rectangular hole measuring 9×4 cm, the axis of which is located at an angle of about 40° to the horizontal.

The Tokariv plow is distinguished from other harrow harrows from the East European peatlands by the location of the harrow transition into the skid near the rear end of the latter, a narrower chute, the rounded shape of the cross-section of its front end, the peculiar shape of the harrow bend, and the presence of a through hole in the initial part of the harrow bend. Judging by the location of the place of transition of the shaft into the skid, this latter in the Tokariv plow moved while working, significantly raising its heel. The peculiar shape of the girder's bend and the presence of a hole near the place of its fracture give reason to believe that the girder was either composite, or a roller was attached to it with the help of a flexible connection, to which domestic animals were harnessed, or the front end of the girder rested on the front of the wheel. In this case, a pin was inserted into the hole in question, connecting the short shaft with the front. All other bog plows from Eastern Europe had a long, one-piece shaft that connected directly to the yoke.

D.T. Berezovets, who gave the first description of the tool, suggested that it had an iron broad-bladed pommel, a one-sided shelf, and was therefore an early form of plow. Based on this, he dated the tool to the second half of the 1st

millennium AD. e. But there are no grounds for such a reconstruction: the working part of the tool has no traces of fixing either an iron tip or shelf devices.

The authors of the monograph on the national agricultural machinery of Ukrainians considered the turner's tool exactly as a plow, accepting only the data of D.T. Berezovtsem dating [V.F. Gorlenko, I.D. Boyko, O.S. Kunitseky, 1971, p. 31, 32]. They considered the hole in the initial part of the beam as intended for a rack. This is contradicted, however, by the direction of the axis of the hole, as well as the absence of a socket in the rail for the lower end of the rack. B.A. Shramko also considered the turning tool to be a plough. According to the presence of a settlement of the Scythian period near the site of the find, he attributed it to this period. One cannot fail to note the shakiness of the basis for such dating. In addition, a settlement of the Bronze Age is located not far from the Tokariv peat bog. According to B.A. Shramko, the plow was equipped with a comb, which was contained in the already mentioned hole, hollowed out in the initial part of the share.

However, it is difficult to agree with such a position. Judging by ethnographic and iconographic data [A. Steensberg, 1937, fig. 14; Podwinska Z., 1962, fig. 131, etc.], combs were never located in plowing tools so far from the working end of the skid, as B.A. suggests. Shramko for a turner's wheel. This is understandable. To perform its functions, the comb must be installed on the shaft in front of the working part of the tool or directly near its working end, and at an angle close to 90°. At the Tokarivskyi ral, if we accept the reconstruction of B.A. Unfortunately, the comb had to work at an angle to the ground of almost 150°, which makes it impossible to cut the sod layer normally. According to the proposed B.A. According to the scar reconstruction, the length of the comb should have exceeded 70 cm. Combs of such dimensions are unknown in the Eastern European archaeological material. In addition, as already noted, the use of cheresel in the V-IV centuries. to n.e., which B.A. Shramko dates the Tokariv field, which is more than problematic.

In our opinion, the purpose of the through hole in the initial part of the bend of the shaft of the Tokariv ral can be interpreted unambiguously. Judging by ethnographic data [Y. A. Krasnov, 1975, p. 131, 132, fig. 50, 5, 6; 1976, p. 38-40, fig. 2, 1-4] and iconographic data, as well as by analogy with the well-known Dabergot ral [Leser R., 1928, p. 45, 46; Beranova M., 1975, fig. 2, 4, 5], a long completely wooden or an additional plow equipped with an iron tip, which has an extended working part, was inserted into it. Its main purpose is to loosen the soil from above before the skid lifts it from below and widens the furrow, to grab the raised soil behind it, loosening it during movement, thereby improving the quality of plowing, giving the plowed soil a fine-clod structure. By installing an additional plow so that its wide blade was tilted to one side, it was possible to achieve a partial rotation of the skiff. The adaptation of an additional plow with an extended working part to plows should be considered an important improvement, which made it possible for the plow tool not only to form furrows, but also to loosen the rising soil, at least partially push it to one side. Tools that perform such functions should be considered loosening, that is, plowing. In the case of the Daberghotsk ral, the completely wooden additional ral was about 65 cm long, in the case of the Tokariv ralo – at least 65-70 cm.

One cannot fail to pay attention to the great similarity of other parameters of the Tokariv and Dabergot rales. Their skid is narrow and long, has a similar cross-section, the place of transition of the beam into the skid falls on the rear end of the latter, the same character of the bending of the beam. The main dimensions are very close: the total length of the skid is 70 and 72 cm, respectively, and from the front end to the axis of the beam – 55 and 56 cm, the width of the skid near the heel is 9 and 8 cm, in the middle part – 6 and 6 cm, height near the heel - 13 and 10 cm, the largest height of the beam from the lower edge of the slide - 40 and 42 cm, the smallest height 30 and 30 cm, the length to the straight line from the perpendicular restored from the beginning of the beam to the hole at the end of the beam - 65 and 60 see. In view of this, it is

possible to assume not only the same traditions of making Tokariv and Dabergots rals, but also their chronological proximity.

Dabergotske ralo was dated by the radiocarbon method to 733 ± 80 years AD. e. [Benitzen U., 1968, p. 50-55]. During this period, the territory where it was found was occupied by Slavs, which made it possible to consider this tool Slavic [Gringmuth-Dahlmer E., 1975, p. 85, 86; Beranova M., 1975, p. 9]. These data should be taken into account when estimating the age of the Tokariv ral and determining its belonging to one or another ethnic group. The latter, of course, does not mean that plows of this design could only be used by Slavs/

A plowing tool discovered in 1975 during the excavations of Brest in the 13th century layer is peculiar. (Fig. 50, 1) [T.N. Korobushkina, 1979, p. 16, 17, fig. 1, 1]. It is made of oak in such a way that the part of the trunk processed from all sides served as a straight share, and the branch, which departed at an angle of about 30° , was also quite carefully hewn, forming a plowshare about 45 cm long. The cross-section of the plowshare in the middle part is rounded, in the front one is irregularly semi-oval, which is characteristic of tools that were equipped with iron tips. The very end of the ralnik is fragmented. The length of the beam is only 160 cm. Three through holes of rectangular shape are made in different places in the vertical plane. One of them, measuring 6.5×4 cm, is located at the rear end of the boom and was certainly intended for a handle placed almost perpendicular to the boom. The second hole, measuring 9.5×5 cm, is located at a distance of about 60 cm from the rear end of the boom and is bored forward with an angle of about 15° - 20° to it. According to T.N. Korobushkina, it contained a comb. The third hole measuring 6.5×4 cm is located at the front end of the shaft. The tool has no traces of shelf devices.

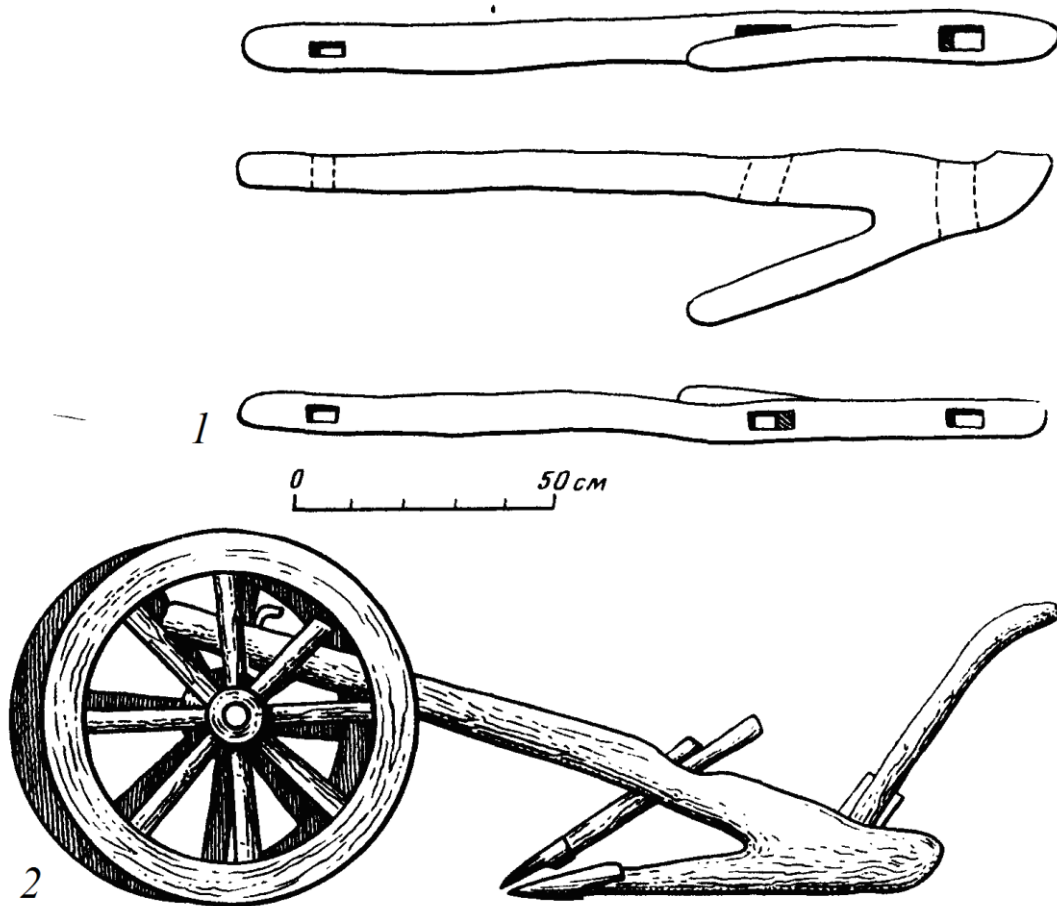


Fig. 50. Rala from Brest:

1 – general view; 2 – reconstruction

According to the general scheme of the design, the Brest ploughshare belongs to the type of ploughshare, but it is distinguished by a short ploughshare, a very small working angle and the location of the handle almost perpendicular to the ploughshare. These features are such that they do not allow us to reconstruct the structure and process of the Brest tool by analogy with the straight shaft plowshares known in the ethnographic material.

The only possible reconstruction of the Brest ploughshare is the one in which the ploughshare is in a position close to horizontal, and the share moves upwards from it at an angle of about 30° (Fig. 50, 2). Such a reconstruction also finds a rational explanation for the fact that the hole for the handle in the Brest rala is located perpendicular to the shaft: if the latter was located at an angle to

the horizontal, then the handle was also bent back. But it would be impossible to harness draft animals to a short straight beam, and the tool itself would be extremely unstable on the move due to the small working angle. This difficulty is eliminated if we assume that the shaft of the Brest ral rested on the front of the wheel 60-70 cm high. The pin that attached the shaft to the front could pass into the hole made in the front end of the shaft. It is hardly possible to assume a different support for the shaft of the Brest tool - in the form of a single wheel or shoe: such devices, judging by ethnographic and ancient iconographic data, had a lower height, and the shaft itself was usually made with a downward bend in the front part [see, e.g. : Brandt R., 1927 - 1929, vol. I, fig. 274; vol. II, fig. 244; Calvin N. M., 1953, p. 165, 167]. A plowing tool with a short shaft that rises steeply up, fixed on the front of the wheel, which appears to us to be a Brest ploughshare, depicted, for example, on a northern French miniature around 1480 [Haudricourt AG, Delamarre M. J.-V., 1955, p. 365, fig. 147].

Under such a reconstruction, the Brest ploughshare could have both a relatively small comb 35-40 cm long, and an additional ploughshare, similar to the one reconstructed in the Tokariv ploughshare. The latter assumption seems more likely for the following reasons. First, the presence of a comb is usually noted in ral with shelf devices [see, for example: Haudricourt A. S., Delamarre M. JB, 1955, fig. 85, 91; V. Orel, 1955, fig. 4, tab. V, 1; Bratanic V., 1960, p. 87, 88], absent from the Brest tool. Secondly, in the archaeological material of Central and Northern Belarus, there are no finds of cheresel. Finally, thirdly, in this territory there are medieval finds of iron tips of plowing tools, which we associate with similar additional plowshares (type IIV2). Thus, the tool from Brest, despite the supposed primitiveness of the fragment that has come down to us, should be considered as an improved ploughshare, which was functionally similar to plowshares and had a wheeled front.

Images of plowing tools on Bosporan coins of the II century are of interest. to n. e. (Fig. 51, 1) [Zograf A.N., 1951, p. 178 and follow. table XLI,

12]. It can be safely assumed that a completely wooden plow with a horizontal slide and a curved share is depicted here. The latter was probably folded, but on the coins it was depicted without a drawbar, that is, its second part, which was attached to the yoke. It is impossible to determine whether the skid was a separate part or one whole with the beam, i.e. whether such plows belonged to the family of skid or beam plows. The place of connection of the girder with the slide is assigned to the rear half of the latter, the handle was installed almost close to the base of the girder and had a horizontal handle. According to the general scheme of the construction, these plows should be classified as the third type of crooked-blade slide and plow plows, widely distributed in the ancient world (Fig. 51, 2-6) [V.D. Blavatsky, 1953, p. 93; I. T. Kruglikova, 1975, p. 163, 164].

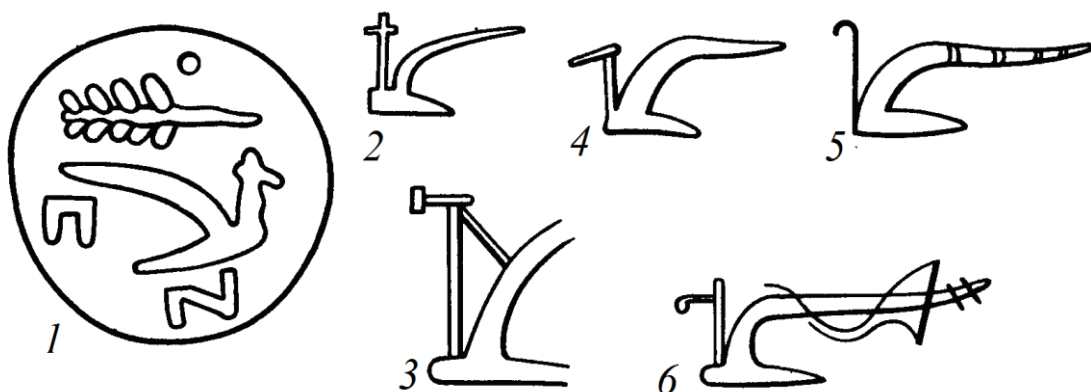


Fig. 51. Image of crooked ridges

1 – on the Bosphorus coin; 2-6 – on Greek and Roman coins and gems (according to A.S.-F. Gow, A.G. Odrikour and M. Zh.-B. Delamarra)

A curved plow with a harrow connected to a skid near the rear end of the latter can be seen in a drawing roughly scratched on a "thank-you-type" gruzik from the Troitsky settlement in the Mozhaisky District of the Mozhaisk Region (Fig. 52) [O.F. Dubinin, 1966, p. 270, 271; 1970, fig. 26, 2]. Probably, it should

be attributed to the family of geraniums. The handle is not shown in the picture, which is sometimes found in ancient images: it was inserted and could be removed. The bend of the shaft is the same as in the Dabergots and Tokariv rales, the shaft itself is short. The pattern of the ral is part of the scene associated with the cult of the mother goddess, who personifies fertility. Gruzzyk belongs to the upper layer of the hillfort and should be dated to around the middle of the 1st millennium AD. e. [Dubinin A.F., 1970, p. 94].

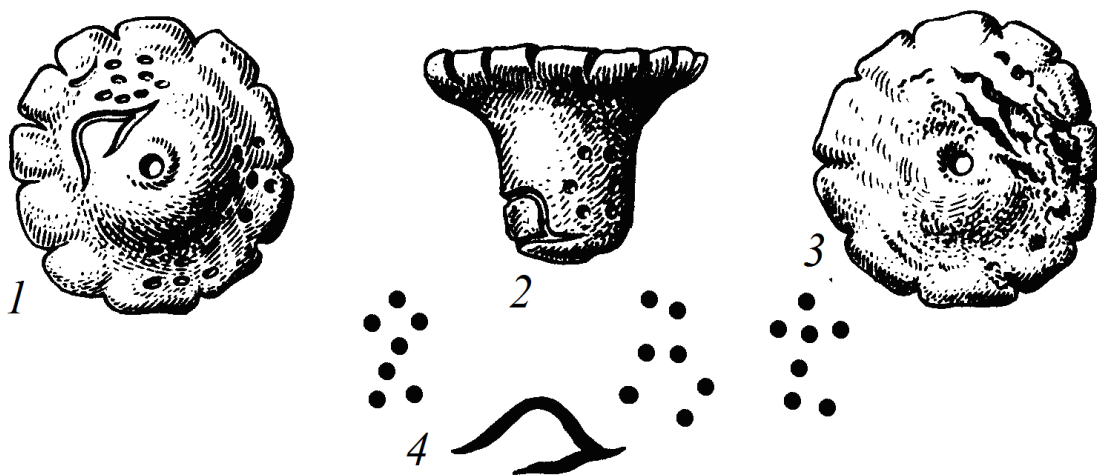


Fig. 52. Gruzzyk from the Troitsky settlement with the image of a plowing tool: 1-3 – general view in three angles; 4 – scan image, according to A.F. Dubinin

The image of a ral can be seen among the complex system of signs on a vessel of the IV century. from Lepasivka in Volyn, deciphered by V.A. Rybakov as an agricultural calendar [B.A. Rybakov, 1962, 1981, p. 322, 324, fig. on the village 325]. Despite the schematicity and small dimensions of the drawing (Fig. 53, 1), a massive straight shaft and a pointed blade in the lower part are clearly visible, inserted from below into the shaft at some distance from its rear end and at an angle to the horizontal. A small stroke on the rear edge of the stock, possibly indicative of a handle. Presumably, the plow is depicted here,

similar to type 3 of Eastern European "ethnographic" plows in a variety with a straight plowshare (see Fig. 53, 2).

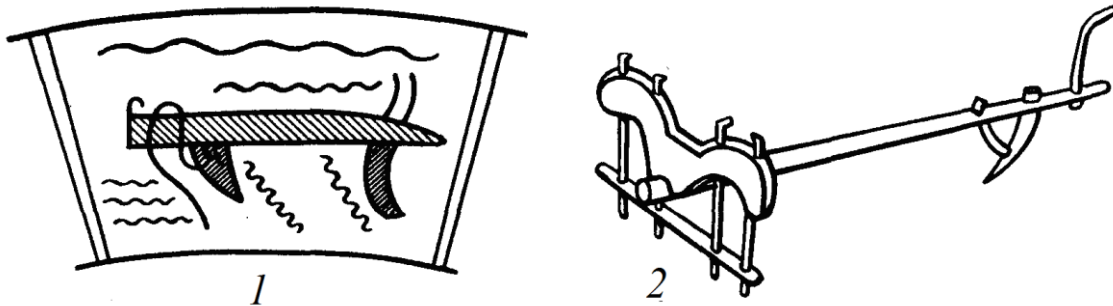


Fig. 53. Rala:

1 – a fragment of an image on an ornamental frieze of a bowl from Lepesivka, according to P.A. Rybakov; 2 – South Slavic palo, according to L. Niederle

Rare images of plowing tools from the West and South Slavic lands can also be used to characterize medieval Eastern European plows with a certain degree of probability. These are roughly scratched ral drawings on stones from Pliska (Bulgaria) of the 9th-10th centuries. [Stances St., 1954, fig. 2, 3], plow from the painting of the chapel of St. Catherine in Znojmo (Czech Republic) in 1134 [Mas in I., 1954, fig. 14] and the plowing scene on the miniature of the "Words" manuscript of Gregory the Theologian from the end of the 11th century, which probably originates from the north of the Balkan Peninsula.

In the schematic drawings on the stones from Pliska (Fig. 54), it is possible to unmistakably recognize the varieties of single-handled straight-blade plows without a stand and with a stand, with the working part placed at an angle to the ground or in a horizontal position⁵. In one of these rails, another detail is shown in front of the rack, the lower end of which is located in front of the slide (Fig. 54, 1). This circumstance, as well as the angle of inclination of this part to the horizontal, allow us to consider it as a comb. According to ethnographic

data, plows with combs usually also had two-sided shelf devices, often removable. In terms of functionality, such tools are far behind primitive furrowed tools and come close to the plow.

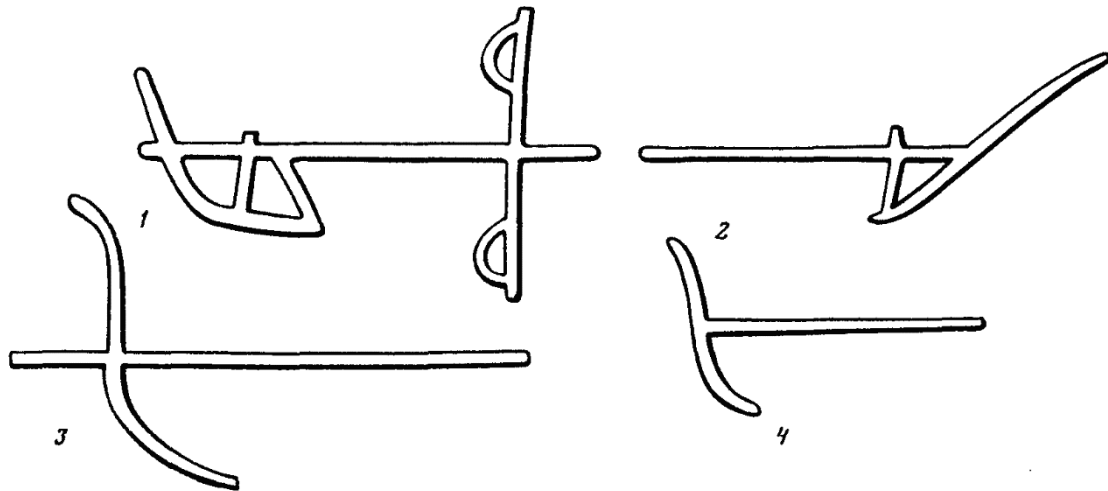


Fig. 54. Images of ral on stones from Plyska in Bulgaria, according to S. Stanchev (1-4)

The Znoyom ploughshare (Fig. 55) is depicted in a team of two oxen or bulls. Its shaft is straight, the handle is bifurcated, the ploughshare is placed at an angle to the ground and is equipped with a small, apparently, narrow-bladed naral. It is difficult to determine the nature of the connection of the shaft with the plow and the handles. According to the general scheme of the design, this plow most likely belongs to the harrow and straight harrow, which were made from a part of the trunk with oppositely directed knots, one of which served as a harrow, and the other two – handles. The closest analogy to it can be type 5 of the Eastern European "ethnographic" ral in the variety with two handles.

On the plowing scene from the manuscript "Words" by Grigory the Theologian (Fig. 56) shown is a curved plough, a ploughshare or a track plough, which had an additional ploughshare set at an angle of about 45°. It differs from

Dabergotsky and Tokarivsky, first of all, by a different location of the place of connection of the shaft and the plow, which allows the working part to move almost horizontally.

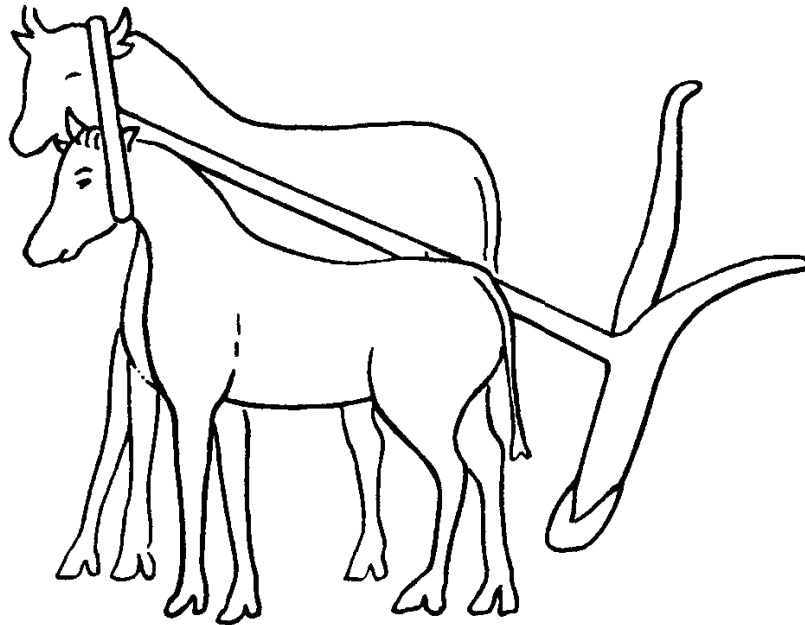


Fig. 55. The image of ralo in the painting of the chapel of St. Kateryny in Znojmo (Czech Republic) according to I. Mashin

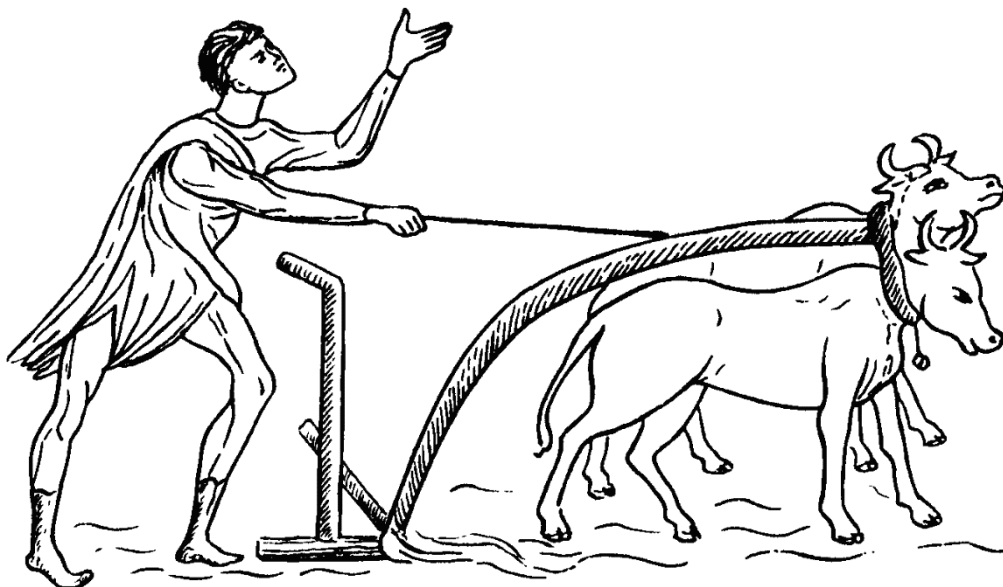


Fig. 56. Image of ralo from the miniature of manuscript "Words" Gregory the Theologian

Due to its relative scarcity, the considered material is extremely important for our topic. He points to the time of the appearance of arable agriculture in Eastern Europe, and shows that among the ancient Eastern European plows there were not only primitive furrow tools that tear or draw, but also plowing tools that appeared at a certain period, with additional plowshares or two-sided shelves, as well as combs. The presence of the latter greatly facilitated the plowing of hard or heavily sodden soils. Some types of medieval plows were probably equipped with a wheeled front. During the period when harrows were the only group of plowing tools in Eastern Europe, they thus went a long way of development in the direction of improving functional capabilities.

This material shows the falsity of the thesis that Eastern European plows evolved from skidless tools to skids: plows with skids predominated among the earliest plows in Eastern Europe. Like the majority of rals, known here according to ethnographic data, in terms of construction, they belonged to the modifications of two main types - single-handled straight-shafted and curved-shafted ones. In ancient times, the wide spread of the ral of the family of greaves, as well as possibly useful ones, which rarely occur in the ethnographic material and clearly in surviving forms, as well as the presence of such types that are not recorded by ethnographic data (for example, the ral of the Tokariv or Brest type) is noted.

We can state further that all types of ancient and medieval Eastern European rales, known from real finds and images, find complete analogies in other regions of Europe. Thus, harrows and harrows appeared in Europe no later than the end of the 3rd millennium BC. [Y.A. Krasnov, 1975, p. 112] and were widely used in the early Iron Age and the Middle Ages. In various varieties, they were depicted on Greek and Roman coins and gems of the last centuries BC. e. – the first centuries AD e. [Gow ASF, 1914, tab. XVII], tombstones from Attica [Brandt R., 1927-1929, vol. I, fig. 120] and Thrace [G.I. Katsarov, 1939, p. 405, 406, fig. 185], reliefs from Italy [Haudricourt AG, Delamarre M. J.-V., 1955,

table. V, 17] and Romania [Canarache V., 1950, p. 83], dated to the first centuries AD. e. Crooked plows with skid plows recorded in French miniatures of the 7th century manuscript. Pentauqe tie Toms [Haudricourt A.G., Delamarre M. J.-V., 1955, table. IX, 36] and the so-called "Encyclopedia of Raban the Moor" of the XI century. [Agriculture. ..., 1936, fig. 9]. These data are supplemented by findings of early Iron Age crooked shafts from Panov, Vievorok, Sjebek, Nizum, etc. [Glob PV, 1951]. The existence of straight-sided gable rals is recorded by two images from the late Roman period [Gow ASF, 1914, fig. 2; Leser R., 1931, fig. 100] and the miniature of the Spanish manuscript Biblia Miliaria [Grupp G., 1923-1925, vol. 2, p. 268].

One-handled straight shaft plows appeared in Central and Northern Europe no later than the middle and second half of the II millennium BC. [Y.A. Krasnov, 1975, p. 68, 69]. In various varieties, in particular with combs, two-sided shelves and a wheel front, they are recorded as monuments of medieval fine art. The most realistic images of single-handled straight-shaft plows without a stand are a late Roman bronze statuette from Durham in England [Gow ASF, 1914, fig. 8], images of miniatures of the Salzburg and Utrecht calendars of the beginning of the 11th century. [Gow ASF, 1914, fig. 13; Brandt R., 1927 - 1929, vol. I, fig. 374], an engraving of Florentine origin of the 15th-16th centuries. [Brandt R., 1927 - 1929, vol. II, fig. 109]. Among the images of single-handled straight-spinning rales with a stand, three images of the 15th century should be noted. from Denmark [A. Steensberg, 1937, fig. 16 - 18], as well as a drawing of the 16th century. from Portugal [Haudricourt AG, Delamarre M. J.-B., 1955, fig. 87].

The plow of a four-element design, which is genetically related to the one-handled straight shaft plows, is depicted on the miniatures of the English Gaedemon manuscript of the beginning of the XI century. [Steensberg A., 1937, fig. 7], to the German manuscript Chronicon Zweifaltense minor around 1162 [Brandt P., 1927 - 1929, vol. I, fig. 193], to the Canterbury Psalter of the 12th

century. [A. Steensberg, 1938, p. 266], on the painting of the church in Elmelund (Denmark) of the 15th century. [Brandt R., 1927 - 1929, vol. I, fig. 291]. All of them are shown with combs, and the plow of the Gaedemon manuscript miniature is shown with a wheel front. These data, together with the analysis of the ethnographic material, once again emphasize that the ways of development of the plow during the period we are interested in were largely the same throughout Europe.

Finally, a typological analysis of the oldest Eastern European plows can shed light on the question of the origins of arable farming in the considered territory. At the same time, we proceed from the already mentioned position, that in the peculiarities of the structure and articulation of the main parts of plowing tools, certain features can be distinguished, in which the cultural and historical tradition of their manufacture is manifested. Such traditions are formed in places of formation of types of plowing tools under the influence of ecological, technological and socio-economic factors and are initially purely technical. Over time, they gain stability, are established in the practice of many generations, and become, in fact, cultural and historical traditions. Following the distribution of certain types of plowing tools at different times and in different territories based on the identification of similar traditions, we can draw certain conclusions about the centers of their origin and the ways of their spread [Krasnov Yu.A., 1975].

As already mentioned, the most ancient Eastern European harrows typologically belonged to two significantly different types - single-handled straight-armed and curved-armed harrows. The center of the emergence of single-handled straight shaft plows should probably be considered the regions of southwestern Central Asia, the Indus valley and some adjacent territories, and the time of their emergence should be attributed to the end of the 4th or the beginning of the 3rd millennium BC. [Y.A. Krasnov, 1971, 1975, p. 84-88]. How could they penetrate into Eastern Europe?

The oldest Eastern European finds that testify to the use of this type of plowing tools are the earliest in Europe. The rock images of the same type from the Val Fontanalba and Val della Merovillo in Northern Italy date from 1500-1000 BC. e., from Val Camonica (Northern Italy) - 1000-500 BC. e., from Boguslen (Southern Sweden) - 800-500 BC. e. [Gloh PV, 1951, p. 118, 126; 1954, p. 16]. In the III-beginning of the II millennium BC. e. in the Middle East, in the Eastern Mediterranean and adjacent regions of Southern Europe, other types of plowing tools were widespread, which cannot be linked genetically with single-handed straight-shaft plows [Krasnov Yu.A., 1975]. Early varieties of the latter are unknown in the ethnographic material of the Mediterranean and the Balkans. This obviously excludes the possibility of their penetration to Europe via the southern route, through the Mediterranean and the Balkan Peninsula. Apparently, the Caucasian path should also be excluded. Although in the Caucasus and Transcaucasia we do not know of indisputable finds of either ancient plowing tools⁶ or their ancient images, the extremely rich and diverse ethnographic material of this region, in which clearly different time complexes of plowing tools are presented, does not give grounds for the assertion that in the Caucasus ever used single-arm straight shaft plows.

Thus, if we accept the hypothesis about the Central Asian origin of one-armed straight-spinning rales, it remains to assume that the path of their spread to Europe lay north of the Caspian Sea and passed through the Black Sea steppes.

Another possible way of penetration into Eastern Europe of gabled crooked gables seems to be different. The center of their origin should be sought in the regions of the Eastern Mediterranean, and the time of formation should be attributed to the period no later than the end of the III millennium BC. [Y.A. Krasnov, 1975, p. 132, map fig. 51]. The initial stage of the spread of this type of plowing tools in Western and Northern Europe is marked by the findings of curved harrows in the peat settlement of Lago de Ledro in Northern Italy in

the middle or end of the 2nd millennium BC. e. [Battaglia L., 1943, tab. Villa]. About the date, see: [Y.A. Krasnov, 1975, p. 114], in a swamp near Valle in Germany (about 1800-1500 BC, critical analysis of dating [see: Krasnov Yu.A., 1975, p. 115], in Hvorslev (Denmark) of the second half of II millennium BC [Lerche G., 1968, p. 56], as well as some rock images of Val Fontanalba [Glob P.V., 1954, Fig. 6; Krasnov Yu.A., 1975, p. 114, Fig. 40] and Bohuslena [Glob P.V., 1951, pp. 25-27, fig. 23]. One cannot fail to note the presence in the ethnographic material of the Caucasus of a very ancient layer of plowing tools in the form of ridged curved plows [Leser R., 1931, fig. 203, 204; Dzhambuladze G., 1960, tables 1, 2; Kaloev B.A., 1957, p. 70]. Based on indirect data, the time of the appearance of arable agriculture in Transcaucasia should be attributed to the time no later than the III millennium BC [Kushnareva K.X., Lysytsina G.H., 1979].

Considering the fact that the supposed center of the emergence of curved-shaft rals is located in the Eastern Mediterranean, and the circumstances that these rals could have appeared in the Caucasus very early, and their Western European finds turn out to be generally no older than the rals from the barrow in the village of Verkhnya Mayivka, it can be assumed that the rals of this design could enter the territory of Eastern Europe from the center of their origin or from the west, or from the southeast, through the Caucasus.

The discovery of a fragment of a plowing tool in the mound "Vysoka Mogila" indicates that certain groups of ancient Yam tribes were familiar with agricultural farming and the use of single-handled plows. The ancient Yam cultural-historical community was formed on the basis of various groups of the Late Neolithic population of the Caspian-Black Sea steppes as a result of a number of factors, of which perhaps the most important was the economic factor - "the spread of the productive economy to new vast territories and the development of new forms of it" [Merpert Ya. Ya ., 1974, p. 128]. The most likely source from where the production economy could penetrate the borders of

the European and Asian steppes, where "the first archeologically attested wave of the spread of early ancient Jamaican tribes" is recorded [Merpert Ya. Ya., 1974, p. 147], was Central Asia, the cultural influence of which reached here through its northern periphery and the Eastern Caspian Sea, and it can be traced not only to the time of the formation of this community, but also to later periods [Merpert Ya. Ya., 1974, p. 140-146]. These data are well consistent with the presented idea of the penetration of one of the oldest types of plowing tools from Central Asia into Eastern Europe through the Caspian-Black Sea steppes.

The existing ideas about the ways of formation and cultural ties of the tribes of the catacomb cultural community, with one of the local variants of which the plow from the mound near the village is connected. Verkhnya Mayivka, do not contradict the hypothesis of the penetration of rifted meanders into the south of Eastern Europe from the west, through Central Europe, or from the southeast, through the Caucasus.

The fact that the basis of the economy of the Late Yam and Catacomb tribes was cattle breeding, and agriculture, except for the western outskirts of their range, played a clearly subordinate role, cannot in any way contradict their familiarity with plowing tools. Ethnography knows many examples of this kind. Let us point at least to the tribes of the Northern Altai [Potapov L.P., 1935, p. 33-74], Tuvans or Mongols [G. Ya. Potanin, 1881, p. 111], which, by the way, as the only type of plowing tools, also used one-handled straight shaft plows with a short wedge-shaped slide and without a stand between the shaft and the working part.

Plow from a peat field near the village. Polissya was found in the area of Corded Pottery cultures and coincides with them in terms of chronology. Many authors, based on indirect considerations, pointed out the high probability of acquaintance of corded pottery tribes with arable agriculture of both Central and Eastern Europe [Patzold J., 1960, p. 189-230; Berezanska S.S., 1975, p. 192-198]. Apparently, at least some of the Corded Pottery tribes were the first

population groups in the western and southwestern regions of Eastern Europe to switch to arable farming and use a harrow type harrow.

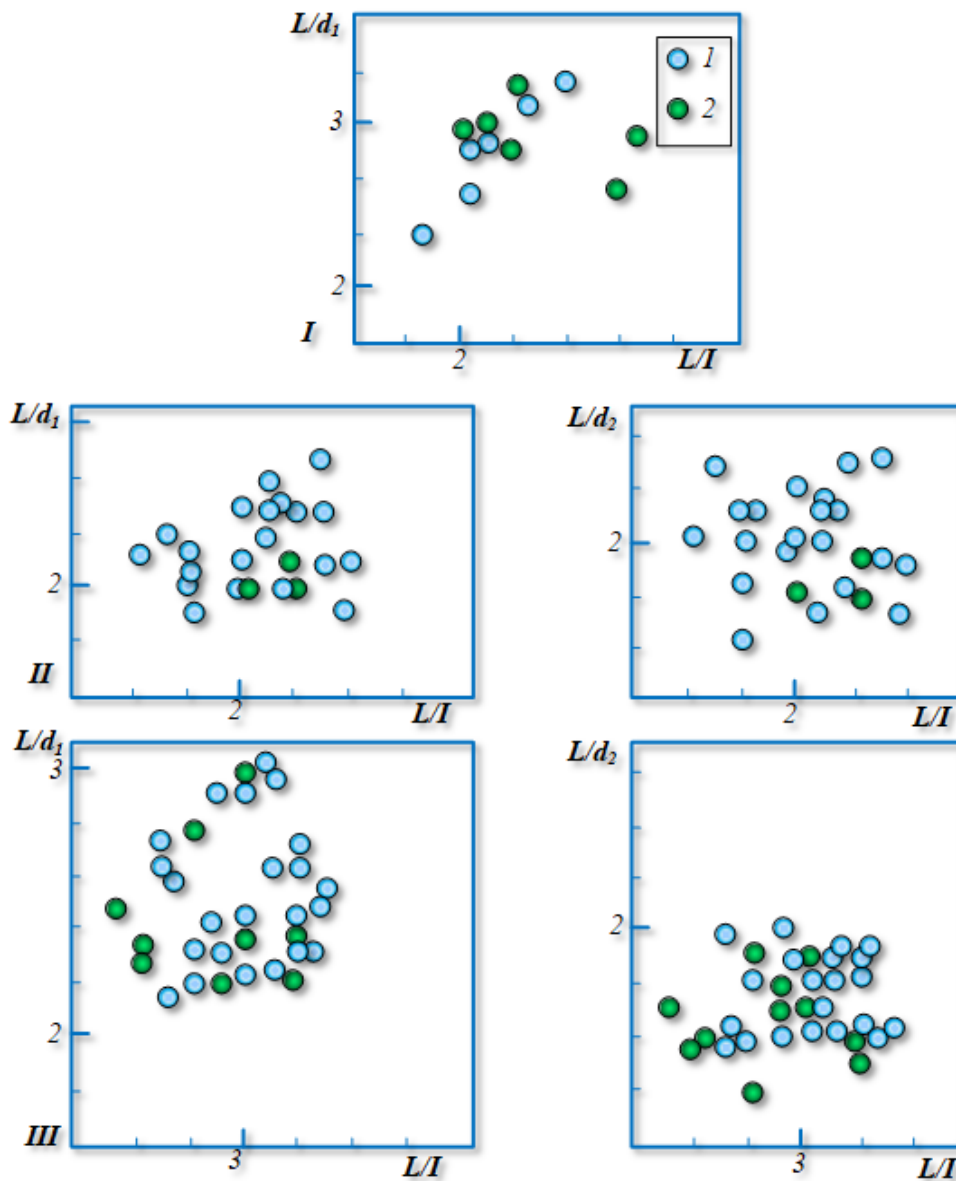


Fig. 57. The ratio between the main measurements of some types of divers:
 1 – "archaeological"; 2 – "ethnographic"; 3 – naralniks of the IA3 type and naralniks of "ethnographic" rals with a straight shaft and a straight shaft inserted into the shaft from below; II – naralniks of type IB1 and naralniks of the "ethnographic" rala design with a handle with a short ralnik installed almost horizontally; III – type IB2 rifles and rifles of "ethnographic" rifles with skids of various structural schemes, genetically related to single-handled straight-shafted rifles

Significant information about the history of Eastern European rales is provided by the analysis of their iron tips from archaeological finds. From the whole mass of such tips, they can be attributed to rala. Their geographical distribution shows that plows were known throughout the ecumene of agricultural agriculture in Eastern Europe. Obviously, their ethnographic area was only a small part of the area of former distribution.

An important, but extremely difficult task, which is not always solved unequivocally, is the "tying" of certain types of "archaeological" spears to certain tools that actually existed and are known in archaeological, ancient iconographic or ethnographic material. The most reliable method is the comparison of "archaeological" tips with the mouthpieces of different types of ral from ethnographic material.

According to the features of the shape, dimensions and proportions, IAZ-type tips can be compared with the type 3 "ethnographic" rales with a straight ralnik (Fig. 57, I; 58, I; 59, I). The relative paucity of tips of this type in the archaeological material is quite clear: even in the recent past, such plowshares were rarely provided with iron awls.

Naralniks type IA4, as already mentioned, are genetically related to naralniks of the IAZ type, as if continuing the series of these last ones, but distinguished by massiveness, large dimensions and length of the sleeve, were used, obviously, on rather large tools with an inclined working part, worked on hard, uncultivated soils. The great similarity of the tips in question makes it likely that the tools corresponding to them were close in terms of design as well. The spread of type IA4 tips in the northern forest areas suggests that they were intended for tools similar to the single-toothed "cherkusha", which, according to the scanty data available, was identical in structure to the "ethnographic" type 3 rales with a straight ralnik [Zelenyn D., 1907, p. 25, 20, 148].

IA2 type snorkels, as we were able to see, were also intended for working in an inclined position on heavy soils. There are no such narrators in the

ethnographic material of Eastern Europe. Certain parallels to them can be found in the West Slavic lands, where large plows were equipped with close tips - massive, wide, often with a rounded working edge - with an almost vertically placed plowshare and a high (at the level of the plowman's hands) location of the connection point of the latter with the share (Fig. 60). Their shaft was straight, inserted into the upper end of a massive plow, or, conversely, the plow was inserted into the plow, and the tools themselves had two attached, almost horizontal handles [Mehler J., 1784, p. 124; Podolak J., 1956, fig. 1, 2; I.L. Urbanzowa, 1960, fig. 17, 19]. From a genetic point of view, such plows should be considered as one of the modifications of one-arm straight plows, widespread in Eastern Europe.

Naralniks of type IA1, the earliest of the narrow-bladed group I, are inconspicuous. Specific "binding" of them to certain types of RAL is difficult. One cannot help but note the significant proximity of such tips to Belarusian bipod bipods, which are classified as types 5 and 6 (in the Belarusian variety) of "ethnographic" bipods. A similar type of naralnik is shown in the image of the Znoyom ral. Judging by the width and shape of the cross-section of the front end of the plowshare of some of the ancient crooked plowshares, for example, the Kaplanovych plow, they could well be equipped with such tips. However, the possibility of their use on other primitive types of RAL cannot be ruled out. The similarity of these tips, which made it possible to combine them into one type, indicates rather not that such tips were equipped with one or another type of plowing tools, but only about certain traditions of making tips.

There are direct parallels in the Eastern European ethnographic material of naralniks of types IB1 and IB2. The latter, in terms of features of shape, size and proportions, are most likely to be compared with broad-bladed naralniks of "ethnographic" rales of types 1, 3 (in the variety with a curved ralnik), 4 and 7, which are characterized by the horizontal position of the working part (Fig. 57, III; 58, III; 59, 3). The tips of type IB1 are similar to the

"ethnographic" rals of the same types by the same characteristics, except for type 7, which had a slightly inclined (close to horizontal) position of the working part (Fig. 57, II; 58, II; 59, 2). However, "ethnographic" plows of types 3 (in the variety with a curved plowshare), 4 and 7, judging by their agrotechnical characteristics and scope of application, appeared, as already noted, relatively late, when plows turned from the main tillage tools into auxiliary ones. This makes it possible to limit the possible use of tips of types IB1 and IB2 only to rals similar in structure to the "ethnographic" type 1.

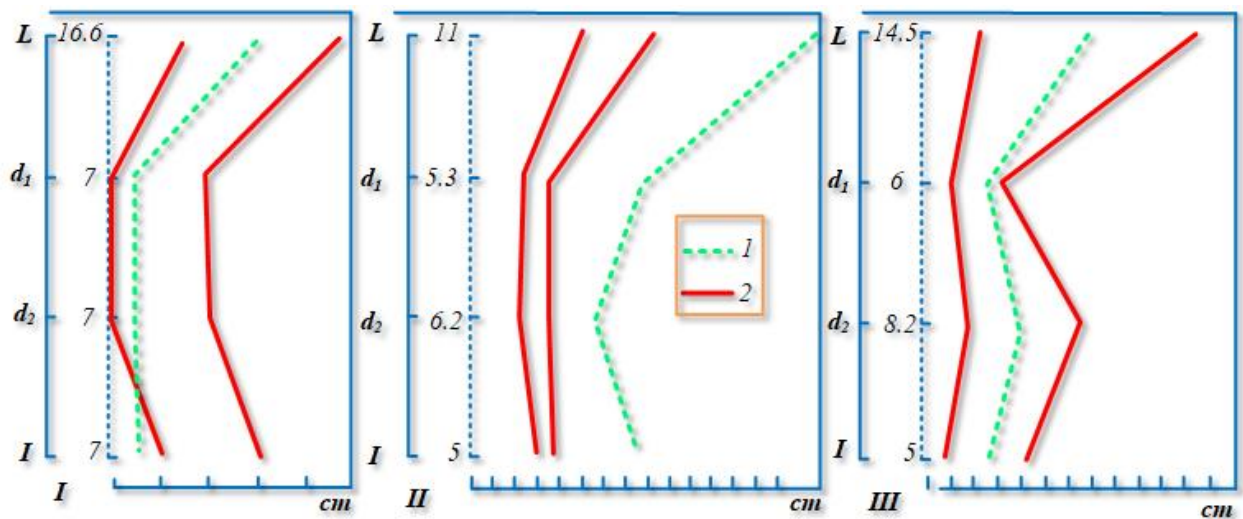


Fig. 58. The main dimensions of some types of diving boards:

1 – "archaeological"; 2 – "ethnographic"; and naralniks of type IA3 and naralniks of "ethnographic" rals with a straight shaft and a straight shaft inserted into the shaft from below; II naralniks of the type IB1 and naralniks of "ethnographic" rals of the handle design with an almost horizontally placed short ralnik; III naralniks of type IV2 and naralniks of "ethnographic" rals with skids of various structural schemes, genetically related to single-handled straight shaft

We will remind that the tips of the type IV2 are characterized by a relatively short sleeve, and their blade in the longitudinal section has a clear bend of the front part down, towards the sleeve. This shows that plows with such

tips had a fairly long horizontal skid. One-arm straight shaft plows without a stand could not have such a skid due to the peculiarities of the articulation of the main parts.

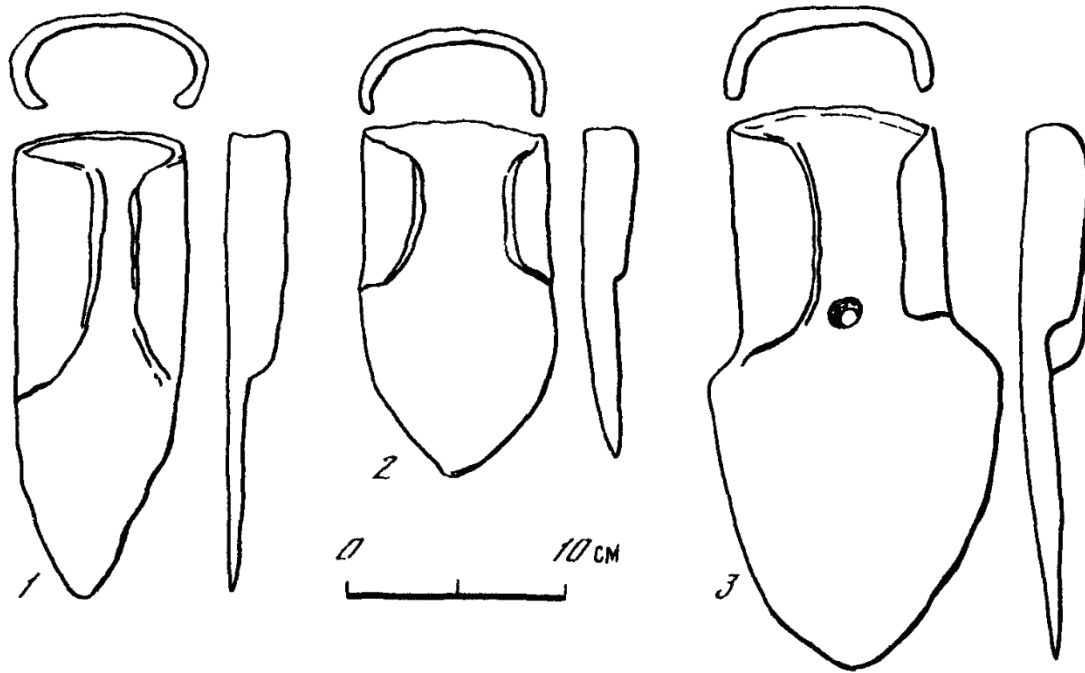


Fig. 59. Naralniks of "ethnographic" rales from the territory of Ukraine:

1 – from a plow with a straight share and a straight plow, inserted into the share from below; 2 – from the ral of the handle structure with a short slide, which is in an almost horizontal position; 3- from the ral of the handle structure with a long horizontal slide

So, tips of type IB2 should be classified as single-handle straight-shaft plows with a rack and a slide. Others could be plowshares for which type IB1 tips were intended. One of their characteristic features is the extension of the sleeve, which was relatively longer than the type IB2, towards the rear. This may indicate that the roller in the corresponding tools was relatively short, and during operation it could not be in a strictly horizontal position, but at some angle to the ground. One-arm straight shaft plows with such a plow could be with or without a stand. The latter are not known in ethnographic material, but at

the end of the 1st and beginning of the 2nd millennium AD. e. is recorded by drawings from Pliska and Western European iconographic material.

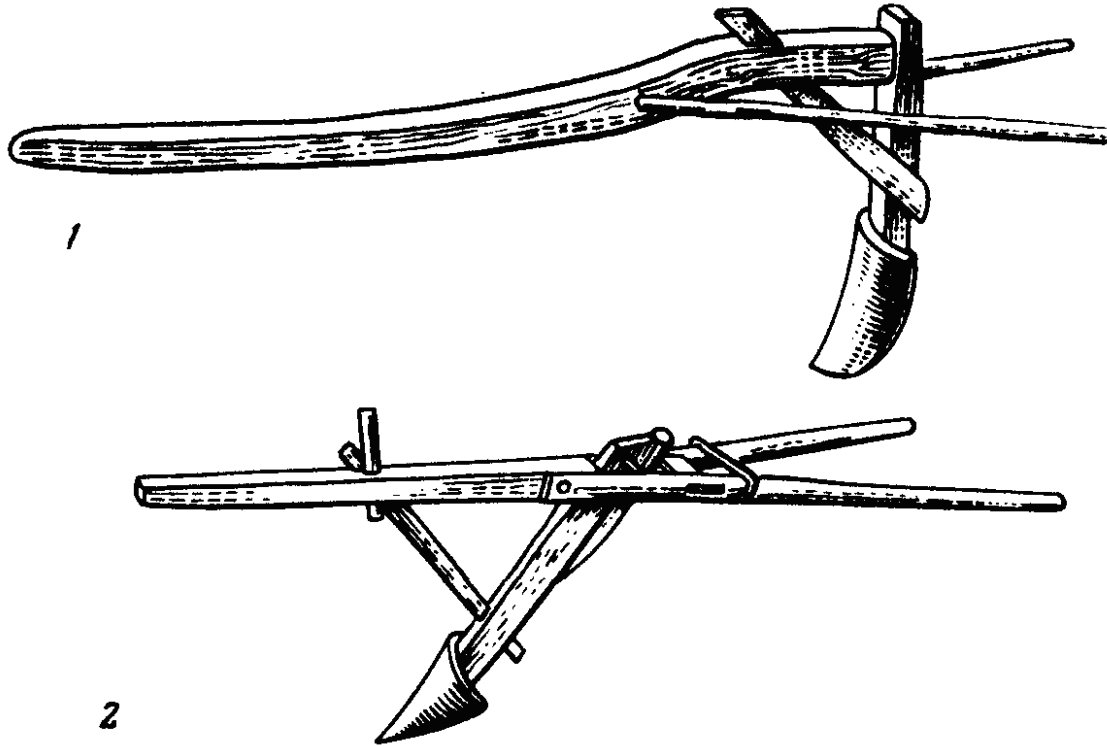


Fig. 60. West Slavic plowshares with a high point application of traction force:

- 1 – North Bohemian plow of the XVII - XVIII centuries., according to I. Meler;
- 2 – Polish plow, according to K. Moshchinsky

We have already noted the possible genetic connection of tips of type IB3 with type IB2, and of type IB4 with type IB1 with a certain influence from types IB2 and IB3, and stated that the differences between these types can only be explained by the evolution of the tips themselves. This gives certain reasons to consider the tips of types IB3 and IB4 as those intended for varieties of single-handed straight-shaft rakes, similar in design to "ethnographic" rakes of type 1.

At the same time, it can be assumed that the rals, which were equipped with tips of the IV3 type, had a long and high skid, which is evidenced by the significant total length of the tips, a very short sleeve, often straight in the

longitudinal section of the blades. Apparently, the plows themselves were somewhat larger than the plows with tips of the IV2 type. At least some plows with non-ends of type IV4 also had, probably, high, wedge-shaped in the longitudinal section of the skids.

In this connection, we note that tips of types IB1 and IB4 are known in the Middle Volga region and Prikamia region. Ethnographic materials did not record rales here: until the second half of the 18th century. they are probably completely obsolete. But among the plows of this area, light single-plough plows and so-called plowshares were recorded [Zelenin D., 1907, p. 90-100; Naidych D.B., 1967, tab. VII XVI, 3, 4; N.A. Khalikov, 1981, fig. 9, 1, 3], the structure of the body of which clearly shows the features of single-handle straight-shaft harrows of a certain variety: one-piece construction of the handle-harrow, short and high skid, straight harrow. This may indicate the presence here in the past of rals of this design, which involved the use of guns with muzzles of types IB1 and IB4.

Tips of type IB1, which worked in a horizontal position, differ from tin IB2 in an average wider sleeve. Therefore, the slide of the corresponding tools was wider than that of single-handled straight-spinning plows of the same dimensions. This circumstance, the distribution of the IB1 clay tippers in the western regions of the considered territory and their relative rarity, direct analogies to such tips in Central Europe, which we will discuss below, give certain grounds for attributing them to rales with a four-element construction similar to "ethnographic" type 2 rales.

Tips of type IB2 have no ethnographic parallels in the east of Europe, but in terms of shape, size and details of the structure, they are similar to the narals of crooked and horizontal skids of other regions [Haudricourt AG, Delarnurre M. J.-P., 1958, fig. . 38-40]. Considering the distribution of such tips mainly in the Northern Black Sea region, where the use of curved plows with a skid is recorded, at least from the early Iron Age by other sources, such an

interpretation of the IB2 mud tips seems very possible.

It is possible to reconstruct the tools equipped with petioles based on the ethnographic materials of the north of the Balkan Peninsula. Here, such tips, which were called *paleshniki*, are clearly connected with the curved-bladed slide and bladed plowshares. Their *paleshnik* was fixed at an angle to the ground above the skid (Fig. 45, 4). The stem of the blade went into a special hole at the rear end of the beam at the point of its bend and was fixed there with wedges, its working part in the form of a blade lay on the front end of the slide, slightly protruding forward. If there was a rack, the torch was also attached to it. If the torch had a relatively short stem (less than 45-50 cm; this is what most of the stem tips from archaeological finds are like), it was stuffed on a wooden beam, which was fixed in the same position [Obrebski J., 1929-1930, p. 10-54; Moszynski K., 1929, p. 159, fig. 136; Zh.N. Vyzharova, 1954, p. 9, fig. 16]. Thus, these crooked plowshares and plowshares had additional plowshares, which are known from a number of ancient finds of plowing tools and their images.

Ethnography recorded tools with additional *ralniks*, which had tips of other types than *paleshniks*. These are various variants of the Mecklenburg *ral* from Germany, Austria and the Czech Republic, the North Bohemian "wheeler" etc. [LeserP., 1931, fig. 64-66, 116, 135, 156, 173; Werth E" 1954, Fig. 86; Haudricourh AG, Delamarre M. JB, 1955, Figs. 32, 110]. But according to the basic scheme of the design, they also belong to the family of curved or harrowed harrows. All this gives grounds for the most likely reconstruction of plowing tools with petiole tips as curved track plows or row plows in their variety with an additional plow.

It is necessary to associate typologically distinct sleeve tips of group II with the additional blades of the curved blade blade [Beranova M., 1960, p. 170, 172; Krasnov Yu.A., 1976; 1981]. Indeed, they worked at a significant angle to the ground, and they were characterized by a rounded cross-section of the socket

with a width of 3.8 to 5 cm. This is less than the lower limits of the change in the average socket width of all other socket tips from both archaeological and ethnographic material, which indicates some special conditions of their application. There are no direct parallels to such plowshares in European ethnographic material, but close tips of additional plowshares occur in plowing tools of Ethiopia [Haudricourt AG, Delamarre M.JB, 1955, fig. 27, 28]. The shape, dimensions and proportions of the tips of group II can be completely compared with the working part of the additional plow of the already mentioned Dabergots plow. Additional tillers with sleeve tips were installed, apparently, at a greater angle to the soil than petiole ones.

It should be noted that some of the tips that we interpret as ploughshares are sometimes seen as plowshares. That's how E.A. Rykman [Rykman E.A., 1959] and M.K. Braichevsky [Braichevsky M.Yu., 1964, p. 35–39] characterized the tips of the Chernyakhov period from Zagaykan and Strimba (type IB1, according to our classification), and V.Y. Dovzhenok [V.Y. Dovzhenok, 1961, p. 44, 45, 74, 75, 252, 259] – tips from Yekymauk hillfort (type IB1, according to our classification) and monuments of the Saltiv culture (types IB2 and IB3, according to our classification).

The most important reason for assigning the tips from Zahaikan and Strimba to the number of ploughshares was the barely noticeable asymmetry of their blades. It seems to us that it was not intentional and is explained by other reasons: the imprecise work of the blacksmith, the result of uneven grinding of the thin edges of these very small tips during a long circular plowing, or a certain way of putting the tips on a wooden ploughshare, when it forms in the longitudinal plane that or another angle with the direction of the girder (see: Krasnov K.A., 1971a for more details on this). We remind you that the tips from Zagaykan and Strimba do not differ from other tips of type 1B1 in any way, except for the already mentioned weak asymmetry of the blade. The latest of them are synchronous with the undisputed plowshares. All that has been said

gives reason to believe that all tips of type IB1 were ordinary naralniks, moreover, most of them were intended for small-sized rales.

Interpreting tips from Yekymauk hillfort and monuments of the Saltiv culture as plowshares, V.Y. Dovzhenok assumed only that combs were discovered together with them, which, in his opinion, are "indisputable proof of the existence of a plow" [V. Dovzhenok, 1961, p. 72]. However, ethnographic data indicate that combs were often and in many areas used and are used not only in plows, but also in a number of varieties of plows [Haudricourt AG, Delamarre M. JB, 1955, fig. 85] (France), (Spain); [Orel V., 1955, fig. 4, tab. V, 1] (Yugoslavia); [V. Bratanic, 1960, p. 87, 88] (Bulgaria, Switzerland, Sweden, Portugal); [Chitaya G.S., 1952, fig. 9] (Georgia)), as well as on special tools of the Russian "drawing" type [Zelenin D., 1907, p. 62 64; Feoktistova L.X., 1980, p. 124-126, fig. 39]. Images of rales with combs are found in medieval Western iconography. As for the considered tips themselves, they do not differ in shape, size and proportions from similar tips of group I from archaeological materials. The width of the bushing is especially telling: even in the largest of them, it does not go beyond the values characteristic of narals from archaeological and ethnographic materials, and it differs sharply from the width of the bushing of the smallest plowshares.

Thus, the study of "archaeological" rales indicates the existence in Eastern Europe of the Early Iron Age and the Middle Ages of most types and varieties of rales, which are recorded here by real finds, iconographic material and data of ethnography. One-handed prnmogradil plows with a developed skid and rack were probably supplied with plows of types IV2 and IVZ; varieties with a shorter blade, which did not occupy a strictly horizontal position during operation, with or without a stand - type IB1 and IB4 bibs. Rala with a four-element design could have tips of the IB1 type, and nolozpi curved shafts with a developed slide – of the IB2 type. IAZ and IA4 types of plowshares obviously belonged to the straight-cut plows with a straight plow insert inserted into the

plow from below. Type IA2 coulters may have provided large plows with the working part placed at a large angle to the ground, and which had a high location of the point of connection of the harrow and the plow. Additional ploughshares of crooked ploughshares were equipped with petioles and bushing tips of group II. The latter could also be used on some types of harrow plows, an example of which is the plow from Brest. The simplest in structure type IA1 naralniks were probably used in various types of rals, but most often in straight- and crooked rales of the family of rales.

Ethnographic material and medieval iconography of Central and Western Europe show that some plowshares had combs. Most often, such devices were found in rals of a four-element design and single-handle straight-shaft machines with a slide, less often – in track-mounted curved-shaft machines, also with a developed slide. Due to the high location of the share, the combs in crooked plows were always larger than in straight plows – at least 45-50 cm long. There are no such plows in the Eastern European archaeological material until the 10th-13th centuries, when the first plows appeared, but in the west they are rarely found. This gives reason to believe that in the east of Europe, before the appearance of the plow, only one-handle straight shaft plows and plows with a four-element design were equipped with combs.

Interesting information is provided by the comparison of divers from the archaeological material of Eastern Europe with those of Central and Western Europe. It turns out that in Central and partly in Western Europe, a sufficient number of naralniks find complete analogies according to all the features we have considered, only early types of Eastern European naralniks: IA1 (Fig. 61, 7-5); IB1 (Fig. 61, 6), IB1 (Fig. 61, 4, 5), sleeve groups II (Fig. 61, 10, 11) and petioles (Fig. 61, 7-9). Tips close to or similar to the IA1 tin were used, for example, on the territory of Germany from late Late Latin to the Middle Ages [Napetapp N., 1929, tab. 5, 6; La Baite W., 1937, fig. 18; Wierschausen D., 1942, fig. AND; Hochmann R., 1957, tab. 13A], the Czech Republic [Cervinska

J., 1928, tab. XIX; Philip J., 1956, p. 326, fig. 72; Kemdrac J., 1954, fig. 24], Poland [Podwinska Z., 1962, fig. 142]. Numerous analogies of type IB1 narlarniks are known on the territory of Poland starting from Roman times [Nowotnig W., 1939, fig. 3, 1-2; Podwinska Z., 1962, fig. 67, 143], the Czech Republic [Eisner J., 1948, fig. 3, 4; Sach F., 1963, fig. 4, 1-3, 5; Beranova M., 1975, fig. 1, 1-4; 4, 3; 6, 1], Yugoslavia [Crmosnik J., 1959, tab. V]. Tips close to type IB1 are known from the southern regions of Germany [Podwinska Z., 1962, p. 81, 82], Austria [Schmidt L., 1956, p. 227 – 229], Yugoslavia (Jirlov R., 1949, fig. 20; Gabrovec S., 1955, tab. 1, 6), and the earliest belong to the end of the Late Latin or Roman times. Narrow socket tips, close to or identical to Eastern European group II, recorded in the north of Germany [La Baite W., 1937, Fig. 18; Podwinska Z., 1962, Fig. 36], in Austria [Schmidt L., 1956, Fig. 2], Czechoslovakia [Beranova M., 1975, fig. 6, 2], Hungary [K. Darnay, 1910, fig. 29], Yugoslavia (V. Bratanic, 1954, fig. 11), where they date from Roman times to the Middle Ages. Petal tips are known in the archaeological material of the north of the Balkan Peninsula, primarily Bulgaria and Romania [Canarache V., 1950; Vyzharova Zh., 1956; Changova J., 1962]. The earliest of them belong to the period BC, the most recent - to the Middle Ages. Several such naralniks were found on the territory of Poland [Podwinska Z., 1962, pp. 260-263, fig. 146-149], in the Czech Republic [Beranova M., 1975, fig. 2, 1, 3], where they are dated to the XI-XIII and VIII-IX centuries, respectively. One medieval - in Denmark [Jirlov R., 1949, fig. 15]. The rest of the types of Eastern European "archaeological" divers have only general analogies in other regions of Europe, which do not extend to the entire complex of features that were taken into account during their selection.

The mentioned circumstances make it possible to assume that the use of iron spearheads was borrowed by the population of Eastern Europe from more western regions together with the types of these tips. This does not mean, of course, that the plowing tools themselves were also borrowed. At the same time,

it seems very likely that most of the types of Eastern European "archaeological" naralniki were created on the spot. Genetic links with earlier types borrowed from outside can be traced in the structure of some of them (see Fig. 38).

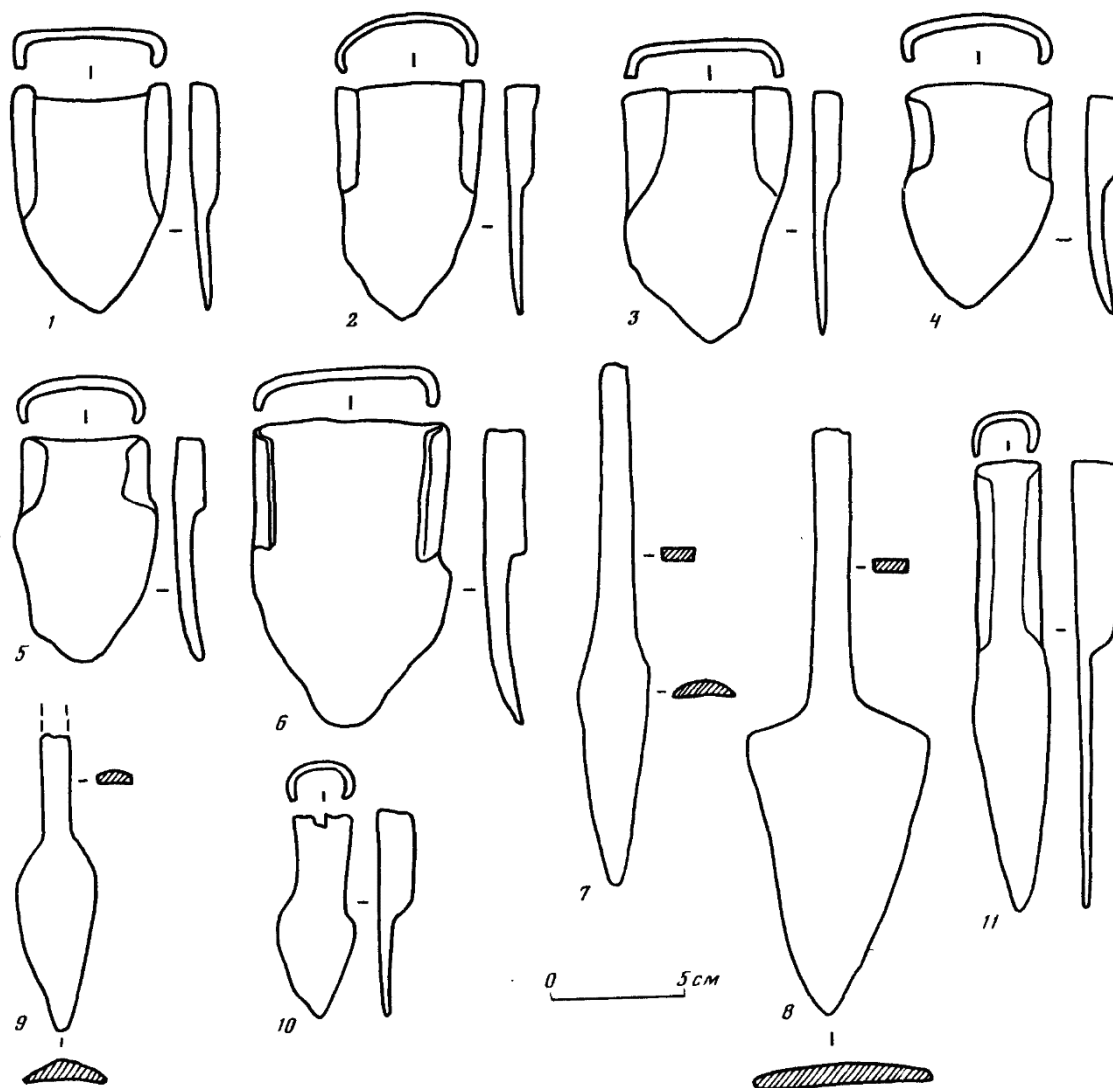


Fig. 61. Naralniki of the Early Iron Age from the regions of Central Europe
(explanation in the text) (1 - 11)

In the first half of the 1st millennium AD. e. at least some rales, judging by the size of the tips, were smaller than the "ethnographic" ones.

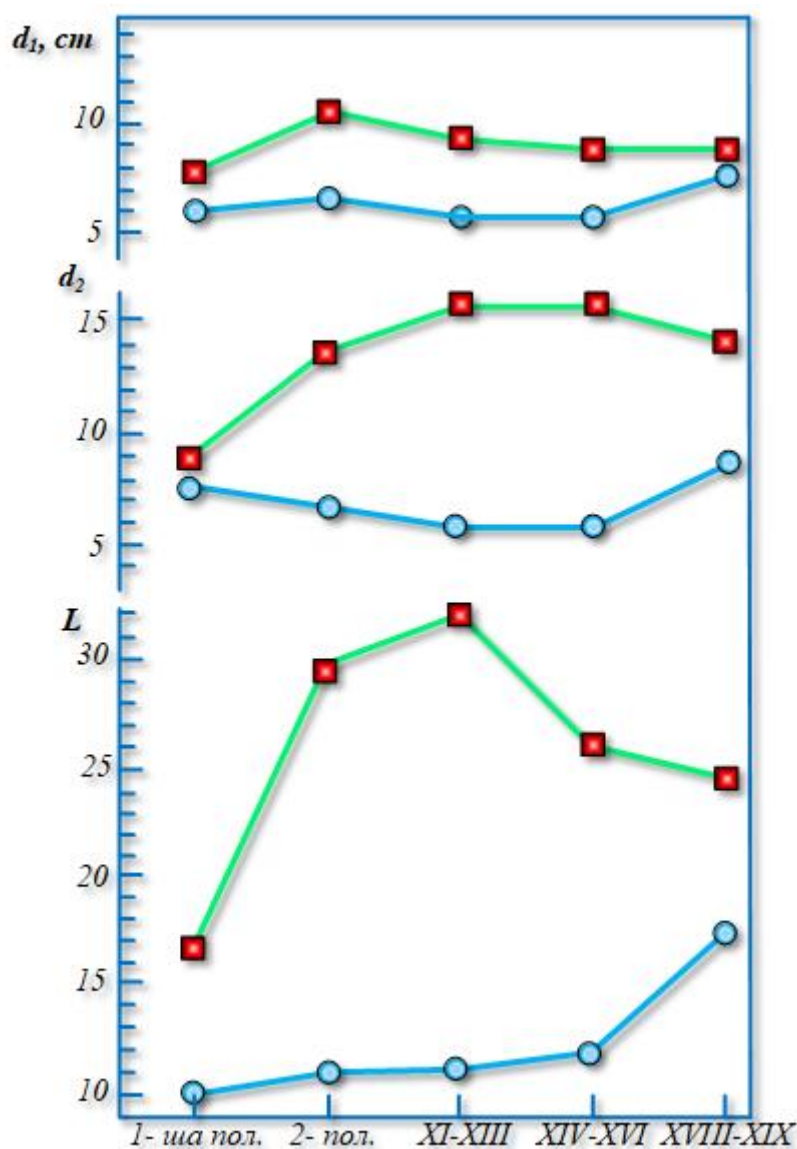


Fig. 62. Chronological changes in the measurements of naralniks in Eastern Europe:

d_1 – the width of the sleeve, d_2 – the largest width of the blade, L – the total length

From the second half of the same millennium, the sizes of naralniks from archaeological materials become quite comparable to "ethnographic" ones. Some reduction of the upper limits of the total length, width of the sleeve and blade of the latter in the XVIII-XIX centuries. can be explained by the change in the functional purpose of RAL, their transformation into auxiliary tools (Fig.

62). Apparently, the rals of the second half of the 1st and the beginning of the 2nd millennium AD. e. in terms of their size, they can be compared with those known in the ethnographic material.

Measurements of real finds of slatted tortuous rals also confirm this position to some extent. Thus, the length of the skid of the earliest plow of this construction in Eastern Europe from the mound near the village of Verkhnya Mayivka was no more than 45 cm, and in the later plow from the peatland near the village Polissya – 62 cm. There is no further increase in the size of the working part. Perhaps this type of ral has not undergone significant changes over time, not only in the general shape and details of the device, but also in the dimensions of the structure, but also in the dimensions.

Let's turn to the most important conclusions regarding the history of Eastern European rural areas.

It is quite obvious that plowshares were for a long time the only form of plowing tools, the oldest in all landscape zones (Figs. 63, 64), everywhere marking the initial stages of arable agriculture.

Figs. 63: 1 – tundra soils; 2 – podzolic and sod-podzolic soils of coniferous and mixed forests; 3 – peat-swamp soils; 4 – nominal-meadow soils; 5 – gray forest soils of broad-leaved forests; 6 – leached and ashed chernozems of the forest-steppe; 7 – chernozems of the steppe zone; 8 – chestnut soils of dry steppes; 9 – mountain-forest podzolic soils; 10, 11 – mountain and forest gray and brown soils; 12 – turf-carbonate soils; 13-salt mines; 14 – boundaries of natural zones; 15 – subzone boundaries; I – tundra; IIa – northern taiga; IIb – middle taiga; IIv – southern taiga; IIg – subzone of mixed forests; IId – subzone of broad-leaved forests; III – forest-steppe; IVa – multi-herb grassy grasses; IVb – derpovazlakovy (wavy, thin and other) walls; V – semi-desert.

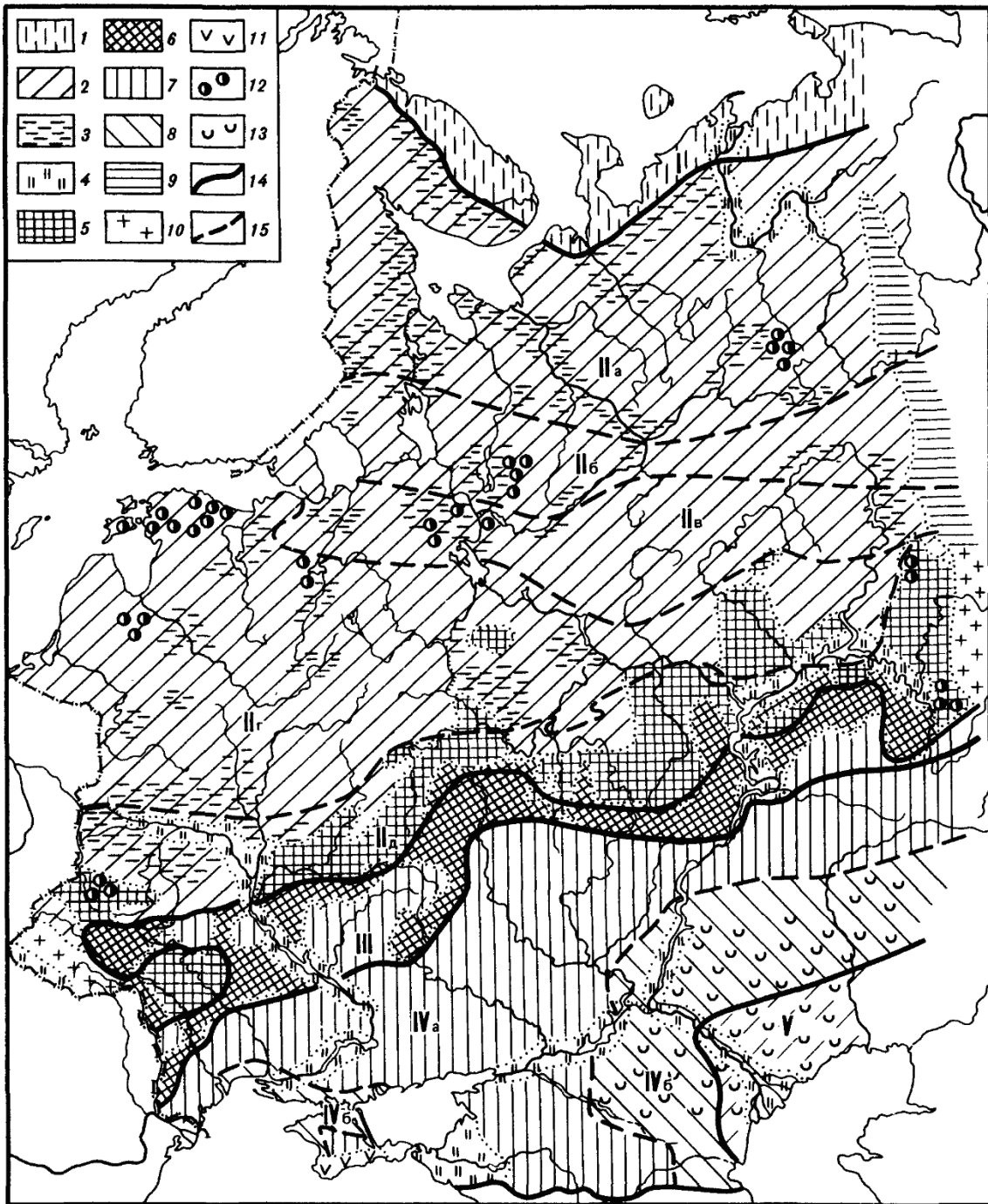


Fig. 63. Soils and landscape zones of the European part of the former Eastern European.

The available direct and indirect data make it possible to outline in general terms the area of arable farming with the use of rala [Krasnov Yu.A., 1971v, p. 41-47, maps, fig. 21-24]. In the Bronze Age, arable agriculture had, probably, only a localized distribution in the south of Eastern Europe. By the

end of this period, the northern limit of arable farming can be outlined in the southern part of the Upper Dniproprovye, as well as in the Middle Volga region and in the south of the Kamia region. It cannot be ruled out that there are beginnings of arable farming in some areas of the Baltic region. Thus, arable farming was widespread in some places in the steppe zone and in the forest-steppe, as well as in the south of the forest zone. In the 1st millennium BC e. it was, as before, widespread in the south of Eastern Europe, in the steppe and forest-steppe zones, as well as in the southern part of the forests in the Middle and Upper Dnieper, having disappeared due to a number of reasons in the forest zone of the Middle Volga region. In the first half of the 1st millennium AD. e. arable agriculture moves further into the forests, covering large areas of the west of the forest zone from the Baltic Sea to the headwaters of the Moskva River, Volga and Oka. Plowing implements are now widely used in the subzone of mixed forests. In the second half of the 1st millennium AD. e. there is a further spread of agricultural agriculture, the northern border of which runs approximately from the Southern Ladoga region to the southeast to the Yaroslavl stream of the Volga and further to the lower reaches of the Vyatka and Kama rivers, capturing the entire zone of mixed forests and somewhat deepening into the southern taiga. In the XI-XIII centuries. its northern border moves even further to the north. Snorkels of this time were recorded at Beloozer and in the Vychegda Basin.

Fig. 64: 1 – the end of the III-II millennium BC. is.; 2 – 1st millennium BC. is.; 3 – the first half of the 1st millennium AD. is.; 4 – the second half of the 1st millennium AD. is.; 5 – X-the beginning of the XIII century.; 6 – the second half of the 13th - 16th centuries; 7 – boundaries of landscape zones; 8 – marginal boundaries of subzones in the forest zone; I – tundra; Ia – northern taiga; Iib – middle taiga; Iiv – southern taiga; IIg – subzone of mixed forests; Iid – subzone of broad-leaved forests; III – forest-steppe; IV – steppe; V – semi-desert.

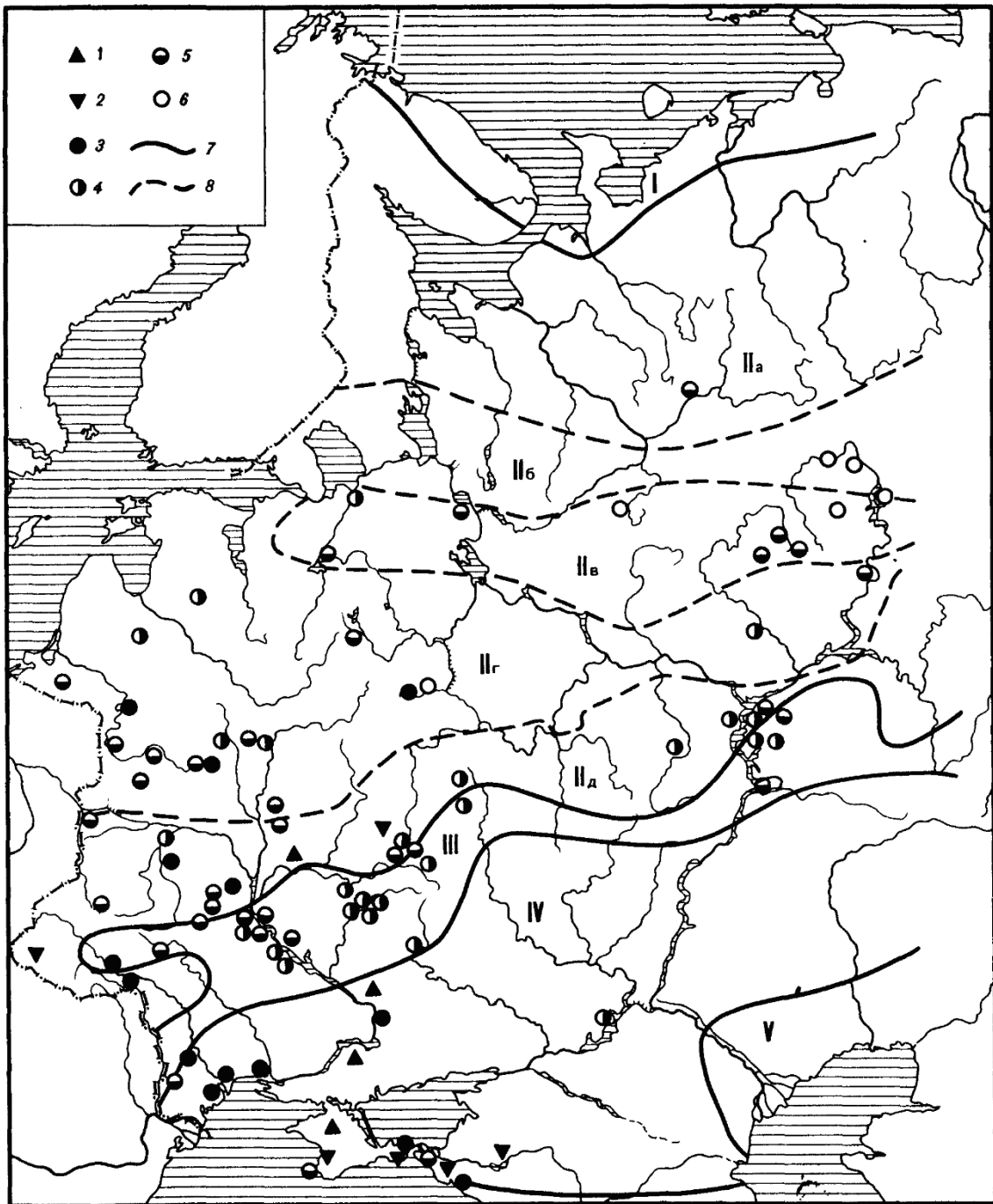


Fig. 64. Findings of rales, their ancient images and iron naraliki on the territory of Eastern Europe

However, the final cultivation of the middle and, especially, the northern taiga for arable farming took place later on the basis of other plowing tools.

Ethnographic, iconographic, and archaeological data in their entirety make it possible to outline the general scheme of the historical development of

Eastern European rural areas in the period we are interested in (Fig. 65). Of course, such a scheme has numerous shortcomings and is largely hypothetical. Bearing in mind that the majority of Eastern European rals of ancient times, the Middle Ages and the recent past in genetic terms appear to be modifications of two types – one-armed straight-shafted and curved-shafted shafts - let's turn to the questions of their origin and chronological change.

In the Bronze Age, two types of single-handled straight shaft harrows were known: a harrow without a stand with a short horizontal slide (the image of the Simferopol stele – Fig. 65, 1) and with an inclined working part (a fragment of a harrow from the "High Mound" mound - Fig. 65, 2). The first appeared here as a result of cultural influences from the Central Asian center of arable farming. It is difficult to judge the place of origin of others. Given the fact that they were widespread in various regions of Eurasia outside the focus of the emergence of single-arm straight-spinning rales [Y.A. Krasnov, 1975, p. 78, 79, map fig. 22], we can assume their relatively independent emergence in the south of Eastern Europe as well. In their further development, both varieties received a rack and iron tips (Fig. 65, 5, 19, 19a, 39), and a plow with a horizontal working body, in addition, a developed skid, two-sided fallow devices and combs, possibly a wheel front (Fig. 65, 11, 17, 17a, 38). On the basis of single-handle straight shaft plows with a slant the supplied working part and the rack formed a type of straight-shaft plow with a straight plow that was inserted into the plow from below (Figs. 65, 12, 16, 22, 35, 36), the transformation of which led, on the one hand, to the appearance of tools similar in basic structural scheme with a high (at the level of the plowman's hands) location of the place of application of the traction force (Fig. 65, 21, 34), and on the other hand – a tool with a curved ploughshare, which often formed a developed skid (Fig. 65, 41). On the basis of single-handle straight-shaft plows with a slide and a rack, plows with a four-element structure of the skeleton were also developed.

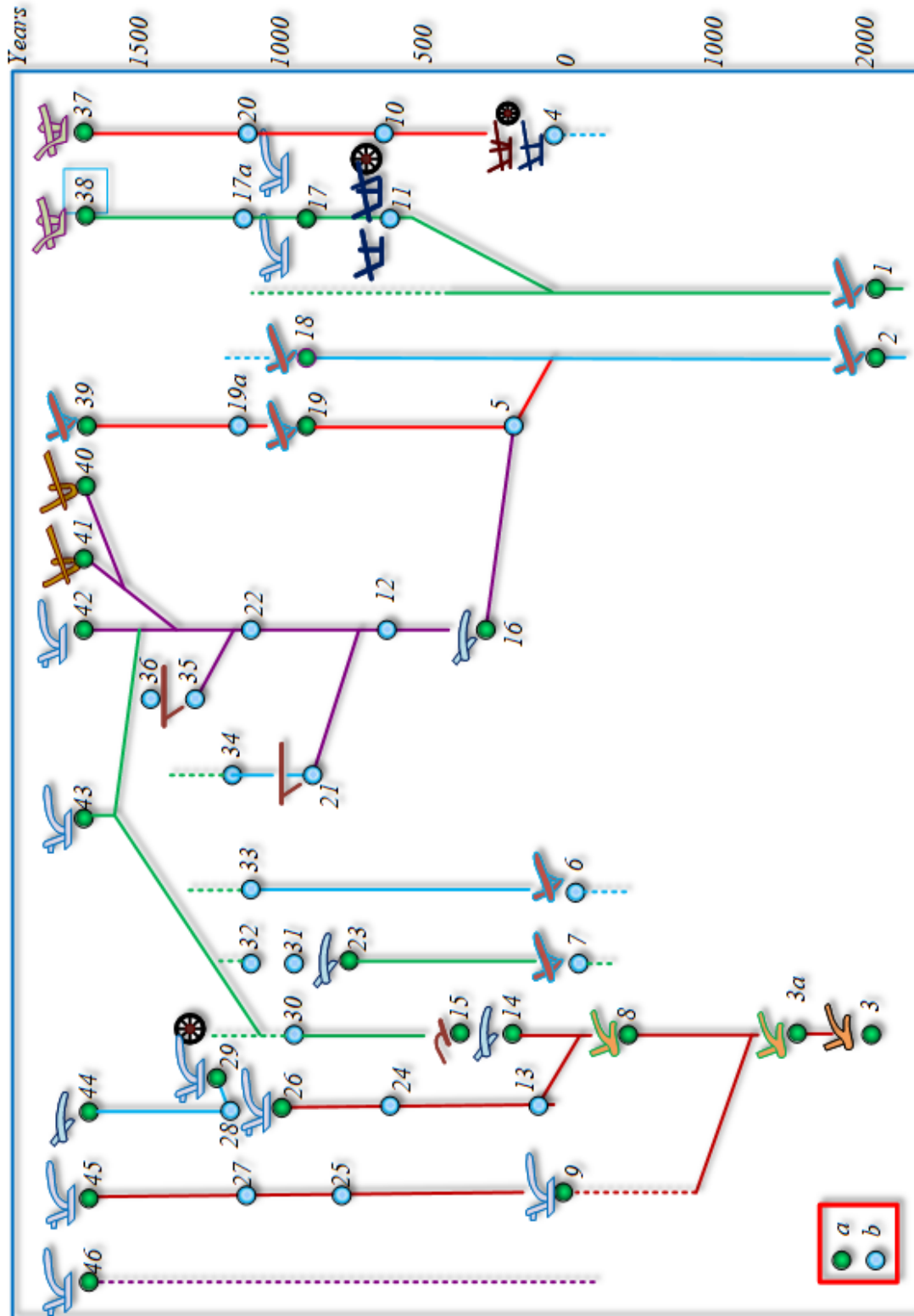


Fig. 65. Chronological changes of ralo in Eastern Europe

Fig. 65: a – finds of ancient rales and their images, rales according to ethnographic data; b – snorkels of various types; 1 – image of the Simferopol

stele; 2 – "High grave" circular plow; 3 – plow from a mound near the village. Upper Mayivka; 3a – peat field near the village. Polissya; 8 – arable land from the Serhiiv peatland; 9 – image of rals on Bosporan coins; 14 – peat field near the village. Kaplanovichi; 15 – the image of a plow on a gruzik from the Troitsky hillfort; 16 – the image of a ralo among the drawings on a bowl from Lepesivka; 17 -19 – image of ral on stones from Plyska; 23 – plow from Tokariv peatland; 26 – Znoyom field; 29 – Brest field. Rala according to ethnographic data: 37 - type 2; 38-39 – type 1; 40 – type 4; 41-42 two varieties of type 3; 43 – type 7; 44 – type 5; 45 – type 6; 46 – type 8. Naralniki from archaeological materials: 4, 10, 20 – type IV; 11, 17a – types IV2, IVZ, IV4; 5, 19a – type IB1; 12, 22 – type IA3; 21, 34 – type 1A2; 35, 36 – type IA4; 6, 33 – petioles; 7, 31, 32 – sleeve groups II; 13, 24, 26, 28, 30 – type IA1; 25, 27 – type IB2

It is difficult to determine the time of appearance of the rack in Eastern European single-handled straight-shaft plows. Indirect evidence of the use of such rales in the first half of the 1st millennium AD. e. finds of combs at the monuments of the Chernyakhiv culture can serve: combs could be used only in rals of the considered design, which had a stand. There are no sufficient grounds for solving the question of whether the rack appeared in the considered rales independently in different areas, or the rales with the rack spread from one or a few centers. The widespread use of such plows throughout Eurasia outside the center of the formation of single-handle straight-spinning plows [Y. A. Krasnov, 1975, p. 76-80, map, fig. 22] rather testifies in favor of the first assumption. Plows with a stand coexisted with ploughs without a stand for a long time. At the end of the 1st millennium AD. e. these last are recorded by images from Pliska (Fig. 65, 18).

Eastern European single-handled straight shaft plows began to be equipped with iron tips no later than the III-IV centuries. N. e., which is evidenced by the finds of IB1 clay urns at the monuments of Chernyakhiv culture. Some of these rals with a rack could also have small combs, known on

the Chernyakhov monuments, as well as shelf devices. Naralniki of this type and combs appeared in the territory under consideration from the west, probably as a result of provincial-Roman influence.

One-handled straight shaft plows with a developed horizontal skid were formed in Eastern Europe, probably in the second half of the 1st millennium AD. as a result of the development on a local basis, the ral of the same structural scheme, but with a short skid (Fig. 65, 11). This is evidenced by the finds of iron shells of types IB2 and IB3, which do not have complete analogies outside the territory under consideration. Often they were equipped with combs, had removable shelf devices and, possibly, a wheeled front.

The main features of the design of single-handled straight-shaft plowshares remained unchanged until the second half of the 18th-19th centuries, when they were recorded by ethnographic data. The fact that the "ethnographic" plows did not have a front wheel, shelf devices and brushes can be explained by their use as a tool for secondary soil cultivation.

Plows of four-element design, genetically related to single-handled straight shaft plows, appeared in the considered territory no later than the beginning of the 1st millennium AD. e., which can be judged from the dating of the earliest tips of type IV1 (Fig. 65, 4, 10, 20, 37). Their formation, most likely, took place outside the considered territory - in Central Europe, where they are widely known according to ethnographic and ancient iconographic data. Naralniks, close to or similar to the Eastern European type IB1, appeared in Central Europe earlier than in Eastern Europe, and probably entered here due to Celtic influence. Ethnographic and archaeological traces of the use of ral with a four-element construction in Eastern Europe are rare and clearly gravitate towards the west. From the very beginning of their existence, such ploughs, apparently, were equipped with iron tips, often had a wheel front and shelf devices.

The oldest evidence of the use of straight plowshares in the considered

territory with a straight ploughshare, which was inserted into the plowshare from below, is a drawing on a bowl from Lepesivka, dated to the IV century. not. Their existence in the second half of the 1st and the beginning of the 2nd millennium is indicated by the naralniks of the IA3 tun. Given the fact that, according to ethnographic data, harrows of the considered design are characteristic mainly of Eastern Europe, it is quite possible to assume that the transformation of single-handled straight-shaft harrows without a skid into straight-harrow harrows with a plow, which was inserted into the harrow from below, could have occurred here as well.

The time of appearance of the ral with a high (at the level of the plowman's hands) location of the junction of the hryadil and the plowshare, which we reconstruct based on tips of type IA2 and some West Slavic ethnographic parallels, can be attributed to the middle or the beginning of the second half of the 1st millennium AD. (Fig. 65, 21). They were used in a limited area and soon went out of use, being probably replaced by the soha.

A harrow with a straight share and a curved share, which was inserted into the share from below (type 3 "ethnographic" shares in the variety with a curved share - fig. 65, 41), with a straight share connected to the share with the help of two racks (type 4 "ethnographic" ral - Figs. 65, 40), as well as the contamination type - crooked harrows with a straight harrow that was inserted into the harrow from below (type 7 "ethnographic" rals - figs. 65, 43), judging by their agrotechnical capabilities and scope of application, recorded ethnography, arose, most likely, only after the widespread spread of the plow and other plow-type tools and from the very beginning were used only as auxiliary tools.

The second most ancient type of ral in Eastern Europe was the curved-bladed, which entered here as a result of cultural influences from the west or southeast through the Caucasus at the end of the 3rd – beginning of the 2nd millennium BC. (Fig. 65, 3, 3a).

Three main directions of their evolution can be outlined. First of all, they were changed by the location of the transition point of the beam into the working part in different places of the skid, which has already been noted. Secondly, on the basis of such plowshares, straight plowshares were formed: the change here is along the lines of replacing the curved plowshare with a straight one while preserving the main feature of plowshares of this family - the fact that the plowshare and plowshare are formed by one part (Fig. 65, 13, 24, 26, 28, 29, 44). Finally, thirdly, part of the harrow plows received an additional plow, which could be equipped with petioles (fig. 65, 6, 33) or sleeve tips of group II (fig. 65, 7, 23, 31, 32).

The evolution of the stilts of the family of stilts into straight-stilts could well have taken place in different places of their range, in particular in Eastern Europe. It is difficult to judge the period in which the formation of a new type took place. If it is assumed that the straight shaft plows could also be equipped with tips of type IA1, their history in Eastern Europe should begin at least from the first half of the 1st millennium AD. e. (Fig. 65, 13). Outside of Eastern Europe, the oldest images of such rales date back to the beginning and middle of the 2nd millennium BC. [Y.A. Krasnov, 1975, p. 138-140, 142, fig. 54, 55, 1, 2].

The formation of crooked tillers with an additional tiller probably took place outside the considered territory. The following circumstances testify in favor of such an assumption. The harrow of this type can be considered a form of contamination: the general scheme of the construction was taken in the curved harrows, and the additional harrow was used in the single-handled harrows. One of the areas where, even in the Bronze Age, crooked plows of the families of cranked and plowed, and where their "hybrid" form could have developed, was the north of Europe [Y. A. Krasnov, 1975, p. 132, maps fig. 35 and 51]. It is here, in the south of Sweden, that there is the oldest image of a raal of this construction (Finpthorp I), which dates back to the end of the Bronze Age or the beginning of the Early Iron Age. The range of iron tips of additional

plowshares in the Early Iron Age and the Middle Ages extended in a relatively narrow strip from the coast of the Baltic Sea to the north of the Balkans. In different parts of it, different forms of tips have developed: in the north - spear-shaped, as well as socket-shaped group II, in the south - petiole-shaped [for more details, see: Krasnov Yu. A., 1976]. The former are often associated with the ancient Germans [Jirlow R., 1949, p. 34], or by the Celts, the second - with the Celts [Wierschausen D., 1942, p. 84-87; Beranova M., 1960, p. 172], the third - with the Thracians [Vyzharova Zh.Ya., 1956, p. 50-53). In view of this, as well as the fact that in the east of Europe the pedicle and sleeve tips of group II appeared later than in its central and southern regions, it can be assumed that the corresponding tools were borrowed by the population of this territory from the west: in the ancient states of the Northern Black Sea - from the Thracians in the last centuries BC. (Fig. 65, 6), in more northern areas - from the Celts or peoples who were under their influence, near the turn of the century AD. e. (Fig. 65, 7).

The available sources do not provide sufficient information about the time of appearance and extent of distribution in Eastern Europe of crooked rals of the family of sleds, known here in some places based on ethnographic material. It can only be stated that such plows are very close in design and functional features to the slatted and curved slatted ones and probably originated in the same center as them [Y. A. Krasnov, 1975, p. 30-32, 108], were widely used in the Northern Black Sea region, where they survived, judging by the finds of IB2 type divers, until the Middle Ages. The possibility of their use in more northern regions is not excluded, as evidenced by the tip of the same type from Drutsk, as well as ethnographic data (Figs. 65, 9, 25, 27, 45).

A few words should be said about the time of the appearance of plowing tools in Eastern Europe, known only in some regions of Estonia and allocated by us to type 8 "ethnographic" tools (Figs. 65, 46). There are no real finds of these single-handled crooked plowshares, as well as their ancient images in the

considered territory. It does not seem possible to associate with them any types of *naralniks* from archaeological materials. According to the basic scheme of the design, they are practically identical to single-handled crooked shaft plows, which were used in the north of Europe as early as the Bronze Age and at the beginning of the Iron Age [Y.A. Krasnov, 1975, p. 92-98, fig. 28, 4, 5; 29, 30, 31] and ethnography recorded in the same areas. This gives some reason to assume that they appeared in the north of the Baltic region under the influence of the west. In the Baltic-Finnish languages, there are many terms related to arable agriculture, in particular "ader" (plough), "pold" (a field plowed with harnessed plow implements) and others borrowed from Germanic languages [Kalima J., 1936, p. 177; Ariste P.A., 1955, p. 19]. According to linguists, such borrowings could have started as early as the second half of the 1st millennium BC. e., but also occurred later [Tomsen W., 1870, p. 164-166; Wiklund K. V., 1933, p. 95, Ariste P. A., 1955, p. 19]. This may indicate not only a certain chronological milestone in the spread of arable farming in the Baltic-Finnish lands [see also: Krasnov Yu.A., 1971v, p. 46], but also on the possibility of the appearance here of single-handled crook-shaft plowshares, widespread in ancient times in the north of Europe, in particular among the Germans.

The intended directions of changes in the design of Eastern European *rales* require an explanation from the point of view of the development of their functional qualities.

The introduction into the design of single-handle straight-shaft *RAL* racks should be considered as an important improvement, which gave the body of the weapon greater rigidity and strength. This made it possible to use such plows on relatively hard soils, making them more durable. The appearance of the rack made it possible to manufacture plows with a long horizontal slide, as well as with different degrees of inclination of the plow.

The appearance of additional plows, as well as two-sided shelf devices, as already noted, marked the transformation of plows from furrows to plows, was

aimed at improving the quality of plowing, creating better conditions for the germination of cultivated plants, which affected the yield.

An increase in the length of the sole in a plow with a skid, which had to be combined with the acquisition of the latter in a strictly horizontal position during work (in curved plows, this was achieved, in addition, by moving the point of connection of the plow with the working part closer to the middle or front half of the latter), with on the one hand, it helped to increase the depth of plowing [Novikov Yu.F., 1963, p. 107], and on the other hand - the stability of the tool [V.P. Goryachkin, 1919, p. 154]. The wheel front contributed to the latter to an even greater extent, providing at the same time the ability to copy the unevenness of the soil being cultivated [Novikov Yu.F., 1963, p. 111]. Changes in plows in this direction indicate that they began to be used on relatively flat, mechanically homogeneous soils that did not have extraneous inclusions, during the cultivation of which the depth of plowing played a significant role. Such could be, on the one hand, old arable soils, because cultivation of soils in any landscape zones leads to an increase in the thickness of the arable layer and its acquisition of uniform mechanical properties, and on the other hand, new lands with sufficiently strong wall or meadow type soils. The processing of the latter was facilitated by the combs used in such rales and broad-bladed rakes, which could cut the roots of grassy vegetation. Archaeological materials give a rather strong confirmation of the stated assumption (Fig. 66). Indeed, the finds of rakes of types ИБ2, ИБ2, ИБ3, which we associate with single-handled straight-spinning and twisting rakes that had a developed skid, gravitate to the regions of the forest-steppe, steppe, as well as to the southern outskirts of the forest zone, where, on the one hand, the development arable farming had a greater antiquity and, therefore, a significant fund of old arable land was created long ago, and from the second - steppe or meadow type soils prevailed.

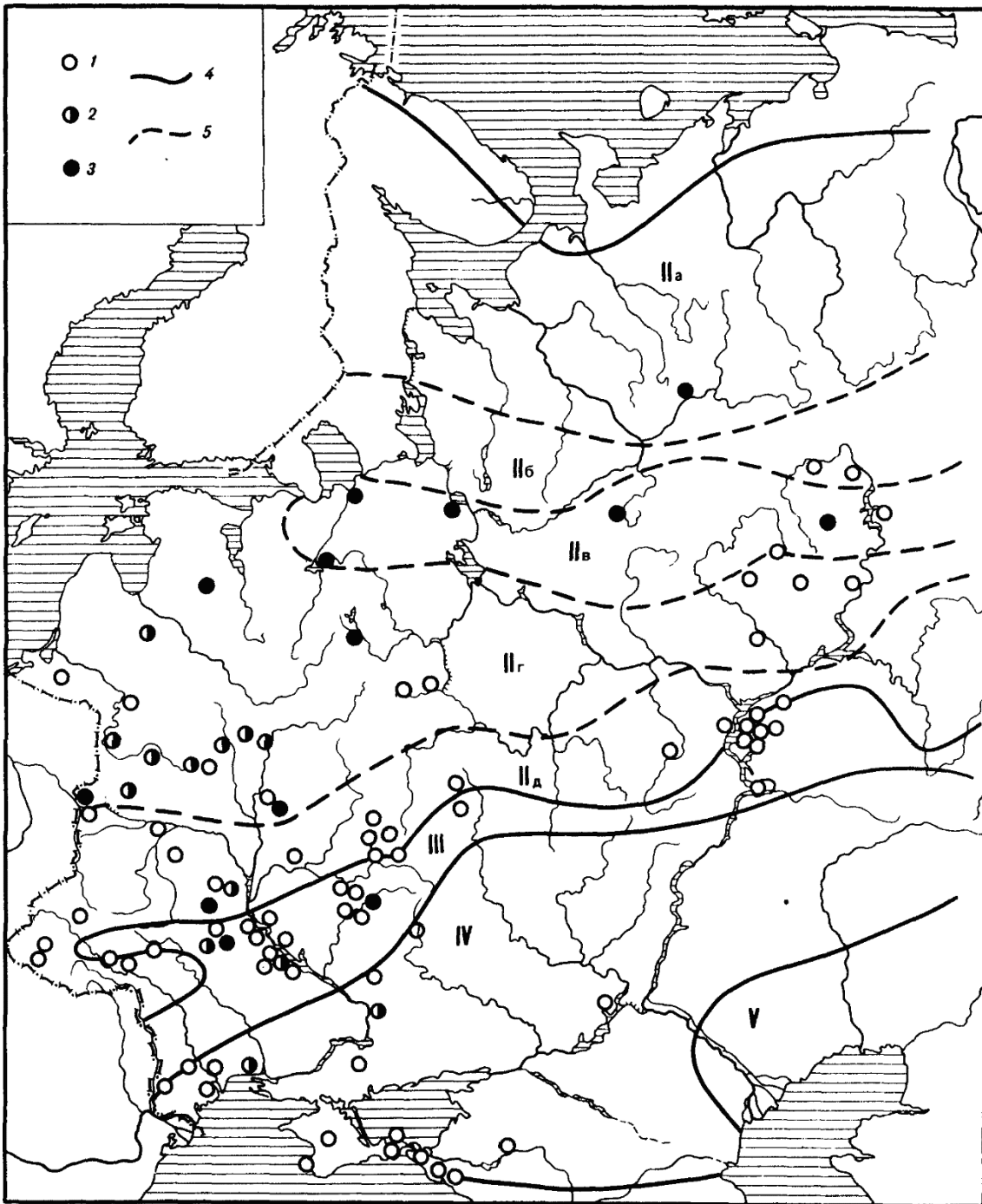


Fig. 66. Distribution in Eastern Europe of plows with the working part placed in a close to horizontal position and without tracks:

1- finds of rales with a skid, their images, naralniks that worked in a position close to horizontal; 2 - divers that could work both in a horizontal and in an inclined position; 3 - divers who worked in an inclined position; 4 - boundaries of landscape zones: 5 - boundaries of subzones in the forest zone; And - tundra; IIa - northern taiga; IIb - middle taiga; IIv - southern taiga; IIg - subzone of

mixed forests; II_d - subzone of broad-leaved forests; III - forest-steppe; IV - steppe; V - semi-desert

One of the types of plowing tools, best adapted to work mainly on old plowed lands with deep and uniform plow layer, there were plows with a four-element construction, which are genetically related to single-handled straight-spinning plows. Their slide was made from a separate part, which made it possible to make it wider for the same dimensions than in single-handle straight-shaft plows, and, therefore, to increase the productivity of the tools.

Shaft and single-handle straight shaft plows (the latter – with a stand) were also changed in another direction - in the way of increasing the place of application of the traction force, and therefore - the center of gravity of the tools. Plows with a high point of application of the traction force are characterized, as already mentioned, by shallow plowing, easy entry into and exit from the soil, which provided them with greater maneuverability. The spread of such plows can be explained by the needs of processing lands with a thin and mechanically heterogeneous soil layer, which required rotary tools that easily leave the soil when encountering obstacles and just as easily enter it, do not allow excessive plowing depth, which infertile subsoil layers can be brought to the surface. In the harrows of the beam design, the increase in the point of application of the traction force inevitably led to the replacement of the curved beam with a straight one, that is, the formation of straight beam harrows, in the cranked harrows - to the appearance of a new way of connecting the beam with the harrow, when it was inserted into the harrow. The latter provided the tools with greater strength of the connection of the main parts [Chernetsov A.V., 1975, p. 77]. Such tools were used in ancient times and the Middle Ages in various landscape zones, but they prevailed in forest areas (Fig. 66). With the growing cultivation of soils and changes in their mechanical properties and the depth of the fertile layer associated with this process, such plows could be replaced by others or turned into tools with a low position of the place of application of the

traction force, without changing the main design scheme. An example of this kind is the Brest ploughland of the 13th century.

It is necessary to pay attention to the evolution of RAL in forest areas. The earliest evidence of such tools indicates that they had a working part that was in a position close to horizontal during plowing. Such is the plow from the peat field near the village. Polissya, Kaplanovytske plough, plough, which is depicted on a gruzik from the Troitsky hillfort. The same position of the working part had plows from the eastern regions of the forest zone, provided with tips of type IB1. Obviously, such tools could not be used on soils that had recently been freed from the forest and therefore had large inclusions of undecayed root remains in the soil. Apparently, they plowed areas that had long been cultivated with the help of hand tools, as well as meadow lands. Plows with an inclined working part, and then plows appear here later, when it became necessary to develop the main massifs of land in this zone occupied by forest vegetation. According to the available data, the beginning of this process in the forest zone, except for its southern outskirts, dates back to no earlier than the end of the 1st millennium AD. is.

Thus, the ancient and medieval Eastern European plows went through a long and complex development path, and were diverse both in terms of design and functionality. In the forest-steppe, on the southern edges of the forest zone, as well as in some steppe areas, where arable farming had a long history and where the cultivation of land began very early, the main direction of the development of rales in terms of functionality was to transform them from primitive furrowing tools into plow-breaking tools, which have a horizontal slide, shelf devices, combs and possibly a wheel front. In the main part of the forest zone, the development of plows went in the direction of the transformation of furrowed splitting tools into scraping ones, that is, from tools with the working part placed in a position close to horizontal, to tools with an inclined plow, more suitable for processing the main soil masses of the forest

zone. Both directions of development were determined primarily by the technology of arable farming, which differed in different landscape zones due to different degrees of soil cultivation. It should be emphasized that the same direction of development in terms of functionality is observed in RAL with different structure of the core.

It is impossible not to pay attention to the territorial distribution of plows of different construction schemes - single-handle straight-shaft and genetically related types, on the one hand, and shaft and skid - on the other. The first were used in the entire ecumene of arable agriculture in Eastern Europe. The range of the latter is limited and extends to the western part of the forest zone and the Northern Black Sea Coast (Fig. 67).

After the appearance of the plow and plowshare, the plow was used alongside them for some time as the main tillage tools. Over time, plows turned mainly into auxiliary tools, lost shelf devices, combs, wheel front, unnecessary in new conditions of use, reduced their range. But the development of RAL in a constructive way continued. At the end of the period under consideration, or, rather, at a later time, several new types of such tools appear, adapted exclusively for auxiliary work on soft arable land.

The most important changes in design and functional qualities

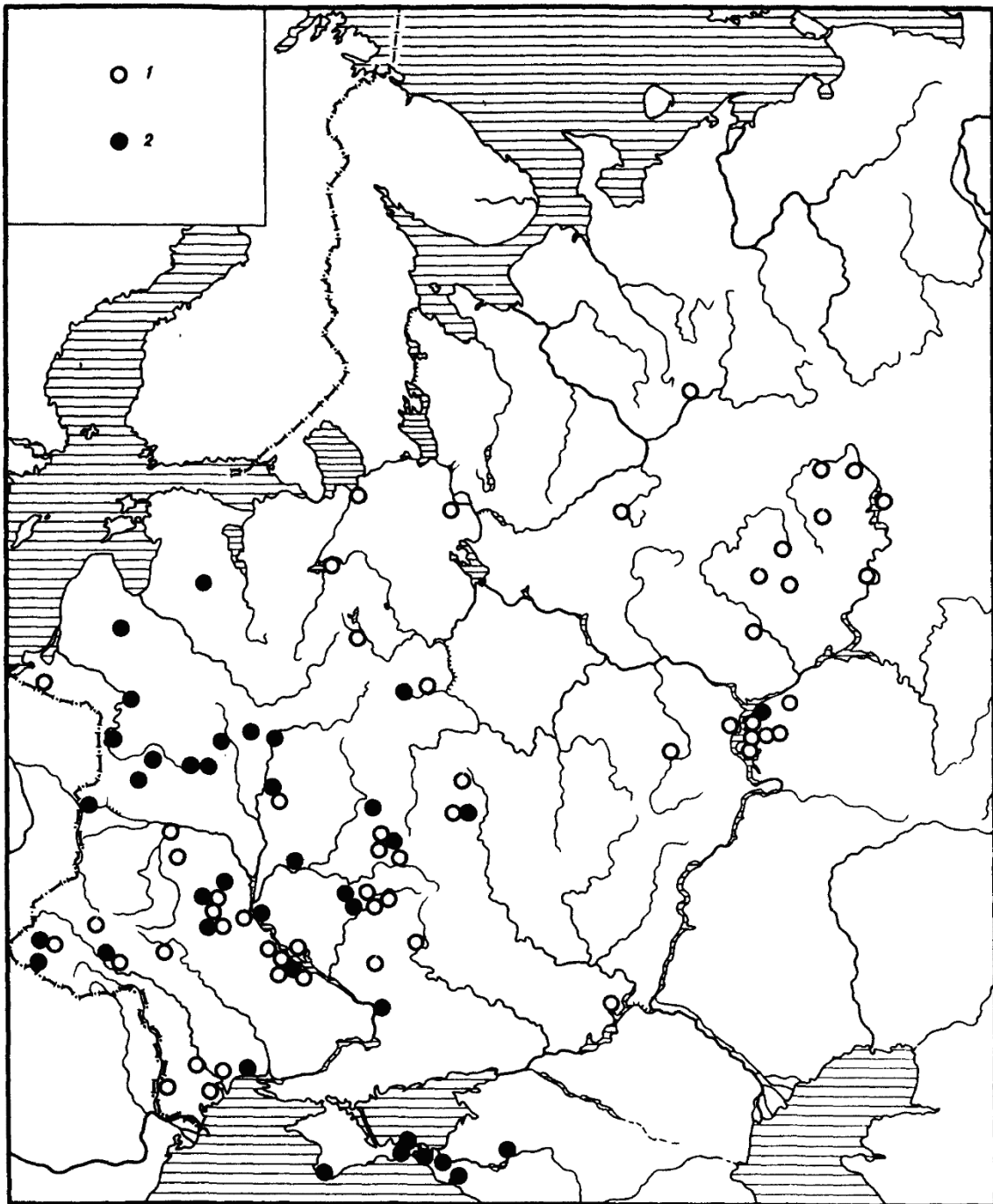


Fig. 67. The spread of rale handle and beam constructions in Eastern Europe: 1-finds and ancient images of rales of the handle design, finds of divers related to the rales of the handle design and their derivatives; 2 - findings and ancient images of rales of the girder structure, finds of divers related to the rales of the girder structure and their derivatives

ral, which testify to major changes in agricultural technology, took place in the

1st millennium AD. e. first in the steppe, forest-steppe and on the southern outskirts of the forest zone, and later, in the second half of this millennium, in the main territory of the forest zone. The largest variety of types and varieties of plow, as well as their greatest perfection, were observed in the considered territory in the Slavic population. This can testify, on the one hand, to the high level of agricultural development, and on the other hand, to the complex ways of formation and broad cultural ties of the Eastern Slavs.

The find of a bushing comb at the Novotroitsky settlement may indicate that at least from the end of the 1st millennium AD. e. some Eastern European plowshares were used in combination with a special tool of the "drawing" type. Indeed, the width of the sleeve of the Novotroits comb is too large to allow its installation in the shaft in the same way as ordinary combs were installed. Obviously, it was used on a special tool, the body of which was similar to the body of single-handle straight-shaft plows with the working part inserted into the shaft from below.

Very important is the question of which farming systems the plow could be used as the main plowing implement. The problem of reconstruction of agricultural systems that existed in ancient times is extremely complex, and on the basis of scanty indirect data provided mainly by archeology, it is unlikely to be solved clearly and unambiguously.

Without providing detailed arguments, which would take us far from the tasks set in the work, we note that most researchers hold the opinion of the domination of the considered territory up to the turn of the 1st and 2nd millennia AD. e. ferruginous and mainly fallow agricultural systems⁷, and in the forest zone, in addition, slash-and-burn and fallow (woodland or forest fallow)⁸ [Slobodyn V.M., 1952a, 1952b; V.Y. Dovzhenok, 1961, p. 100-117; Yu.L. Krasnov, 1973, p. 34-38]. Only in the Northern Black Sea region from the middle or second half of the 1st millennium BC. e. written and some archeological sources allow us to talk about the presence of a steam farming

system in the form of a two-pillar [V.D. Blavatsky, 1953, p. 90-92; I.T. Kruglikova, 1975, p. 161]; however, the fallow system continued to be widely used here as well [A.V. Kiryanov, 1962].

Already in the II millennium BC. e. we can assume the gradual development of lands with soft soil remote from settlements, the exit of agriculture beyond the river valleys, the beginning of differentiation in the degree of cultivation of fields near settlements and further away from them [Krasnov Yu.A., 1973, p. 36]. No later than the middle or second half of the 1st millennium BC. e. in the forest-steppe of the Right Bank of Ukraine and the Northern Black Sea region, winter crops began to be planted next to the summer ones [Ganina O. D. 1968; V.A. Sramko, 1973, p. 158; Yanushevich A.V., 1976, p. 137]. According to ethnographic materials, the latter are characteristic either for the steam system of agriculture, or for short-term fallows with their correct organization. At this time, there is no reason to deny the appearance in some areas within the framework of the fallow system and old arable fields, which Herodotus apparently spoke about in relation to the Dnieper [Herod., IV, 53], and individual elements of the steam system in the form of, for example, annual steams , which were used unsystematically on the arable lands closest to the settlements [Y.A. Krasnov, 1973, p. 36]. Judging by the paleobotanical finds, which include numerous cereals, legumes, oilseeds, and technical crops, crop rotation was practiced here, which is also characteristic of either a steam system or short-term, properly organized fallows. It is very plausible to assume the formation of a steam system in the form of a double pile in the most developed areas of the forest-steppe of Right Bank Ukraine already in the middle of the 1st millennium BC. e. [Sramko VA, 1973, p. 152]. The same was possible in Prikuban, which is very densely populated.

The possibilities of arable farming increased significantly in the 1st millennium AD. e. in connection with the appearance of iron barrows, when there was an obvious further increase in the role of short-term fallows and

elements of the steam system within the framework of the dominant fallow. In the second half of this millennium, the forest zone began to be gradually transformed into fields of long-term use [Krasnov Yu.A., 1973, p. 36, 37].

Thus, plows were used, obviously, under different farming systems - iron, fallow, in particular properly organized, with the dominance of short-term fallows and the presence of elements of the steam system, sawmill and steam in the form of a two-pillar. We should not be confused by the fact that ethnographic materials testify to the use of other plowing tools, which are more advanced in structure, in iron-fallen and steam systems [see, e.g.: Naidych D.V., 1967, p. 34-57]. Ethnographic data from other territories show that very primitive plows could be used during soil cultivation according to these systems. We have already said that in the recent past, single-handle straight-blade plows of a very simple design were used by the Mongols, Tuvans and other peoples of Southern Siberia, in which the restoration of soil fertility was carried out in primitive forms of iron and fallow systems. It must be noted that soil cultivation in the iron and fallow systems in the considered territory was not distinguished by thoroughness, was superficial, shallow [Sovetov A., 1867, p. 274; S.I. Rudenko, 1925, p. 113]. On the other hand, rala on the territory of Estonia as early as the 18th and 19th centuries. were also used in some places during the cultivation of fields within the framework of a steam system with a three-field crop rotation [Feoktistova L.X., 1980, p. 43].

Presumably, the change in the functional qualities of fallows in the direction of their transformation from furrowed implements to arable ones was connected precisely with the development of agriculture according to the fallow system - the increase in the role of short-term fallows, the formation of old arable lands, the appearance of separate elements of the steam system within the framework of the dominant fallow. Indeed, the role of tillage during short-term fallows significantly increases, because good plowing in this case could to some extent compensate for the incompleteness of the process of restoration of natural

fertility and soil structure when the period of "rest" of the plot is less than what is necessary for the complete restoration of natural vegetation on it . The chronological coincidence of data on the appearance of the first rals of the plowing group and archaeological evidence, which indirectly speaks of the development of short-term fallows and the appearance of elements of the steam system within the framework of the dominant fallow, is hardly accidental.

It should be noted that the role of plowing under the steam system fundamentally changes compared to iron and fallow. In iron and fallow, plowing, in fact, only creates conditions under which cultivated plants can realize the natural fertility of the soil. The state of affairs changes slightly even during short-term fallows. Under the steam system, plowing itself participates in the maintenance and restoration of fertility. The steam system is possible only when the field is subjected to several systematic treatments at different depths during the period of being under steam (doubling and tripling of steam). Such processing pursues two important goals. Firstly, it is the restoration of the soil structure, which contributes to the accumulation of moisture in it and the maintenance of an optimal water-air regime. The latter contributes to the strengthening of the activity of soil microorganisms, the result of which is the increased decomposition of organic remains and the accumulation of nutrients in a form available to plants. The second task, which is designed to be solved by steam cultivation, is the destruction of weed roots [Sokolov M.S., 1935, p. 326, 336, 338]. Agrotechnically, properly maintained steam is able to significantly restore soil fertility even without the use of fertilizers. Under the steam system, therefore, plowing implements, the plowman's labor and his skill are the most important forces that create the fertility of arable land.

The harrows used in ancient times were still insufficiently adapted for the thorough processing of steam fields and the plowing of organic fertilizer, without which the steam system could not function normally. Obviously, that is why plows as the main tillage tools were replaced by other tools that more fully

met the needs of the steam farming system.

- ¹Justification of the nomenclature of the types selected here [see: Yu.L. Krasnov, 1075, p. 22, 33].
- ²All the sizes of ral from peatlands given here and below characterize modern ones
the state of the tool, significantly deformed when the wood dries.
- ³The oldest remains of wheeled carts in Eastern Europe, which are known in late burials of the Yam culture community of the end of the 3rd and the beginning of the 2nd millennium BC. e. [Merpert I.Ya., 1974, p. 94, 115]. The earliest reaping tools in Eastern Europe, which can be called sickles in contrast to reaping knives, are the so-called Volyn type, Bopdarikhin and Bilogrudiv sickles (S.N. Bybykov, 1952, pp. 13-16, 21-23).
- ⁴According to I.H. Rosenfeldt, the Troitske settlement existed until the 9th-10th centuries. [Rosenfeldt I.G., 1982, tab. VIII]. Such an extension of the date of the monument seems insufficiently justified.
- ⁵One drawing from Pliska shows a plowing tool with the body of a one-handed straight-sided ploughshare, the working part of which is placed at an angle and seems to be bifurcated at the end. Plowing implements of this type are unknown to us in European ethnographic material, which makes it impossible to draw an unequivocal conclusion about the possibility of two-toothed plowshares living here in ancient times. Such a possibility cannot be categorically denied.
- ⁶Interpretation of horn objects from Arukhlo (V millennium BC) and Kvatskhilebi (III millennium BC) as details of primitive ral in Georgia [Kushnareva K.X., Lysytsina G.N., 1979, p. 13, fig. 4] seems extremely doubtful.
- ⁷The agrotechnical basis of iron and fallow systems is the restoration of the lost fertility of a plot of land exclusively at the expense of nature itself, in a natural way - by abandoning it, stopping cultivation. The system of agriculture, in which a plot that lost fertility was abandoned for an indefinite, usually very long

period, and a new plot was set aside for cultivation, is called iron farming. If such a plot was set aside for a certain, not too long period, and it was necessarily returned to its cultivation after the end of this period, then such a system is called fallow [A.G. Trutnev, 1956, p. 28, 29].

⁸The agrotechnical basis of the slash-and-burn system of agriculture is the use of the natural fertility of forest soils by burning the forest area. The most important means of soil cultivation here is fire, which creates a thin layer of soft soil suitable for sowing and well fertilized with ash, and also destroys the seeds and roots of herbaceous plants [Tretyakov P. Ya., 1932, p. 4]. That is why plowing tools were not used on subsoils. Plots were usually sown for no more than 2 years, after which they were abandoned for an indefinite period to restore forest vegetation.

A forest clearing system or a forest fallow system is a system of agriculture in which harnessed plowing tools are used on a cleared and burned area (usually in the second year after burning), and the area itself, after the loss of fertility, is abandoned to restore natural fertility for a relatively limited period, after which they return to it for repeated cleaning and plowing [Slobodyn V.M. 1952, p. 53]. Only the initial stage of the logging system is similar to the slash-and-burn system. The role of the most important means of tilling the soil under the sawmill system has already shifted to plowing tools; it can be considered as an analogue of the fallow system on lands occupied by forest vegetation.

⁹A steam system of agriculture is called one in which steam is the most important organizational and agrotechnical technique for maintaining and restoring the natural fertility of soils [Trutnev A.G., 1956, p. 30-31]. It is customary to call a field in a crop rotation a steam or a steam wedge, which during the entire growing season or part of it remains unoccupied by crops and is subjected to intensive cultivation with plowing tools, which aims to prepare favorable conditions for the development of crops that are sown in a steam field [Sokolov N.S., 1935, p. 320]. The more or less successful functioning of the steam

system is impossible without artificial fertilization of the land.

According to the amount of land annually set aside in the sowing wedge for fallow, and therefore according to the nature of crop rotation, the fallow system that prevailed in the past in the territory we are considering is usually divided into two-field, three-field and variegated fields. In two years, half of the arable land is sown, half remains fallow. Correct tripilla involves the division of arable land into three parts, one of which is sown with winter crops, the second with spring crops, and the third remains fallow. In terms of the intensity of land use, the tripilla is a step forward compared to the two-field, and even more so with the fallow system. Along with tripilliam and dvopilliam, there are known varieties of the steam system with irregular alternation of crops and steam, which were called variegated field [Saburova L.M., Toren M.D., 1967, p. 18, 19]. The transition from a fallow system to a proper tripilla could only occur through a dvopillia and a variegated field.

CHAPTER 4

MANAGEMENT OF PLOW EVOLUTION IN EASTERN EUROPE

Before turning to the analysis of materials that highlight the problem of the emergence of Eastern European plows, it is necessary to stop at the assessment of those sources that are used to solve this issue in relation to Central, Western and Southern Europe. This is necessary because some researchers attribute the appearance of the plow in these regions to a much earlier time than in the considered territory, and associate the appearance of this tool in the east of Europe with western influence.

It has already been noted that modern studies have repeatedly expressed a skeptical attitude to the thesis that the plow appeared in Europe in the period up to and including the early Middle Ages. Indeed, early (up to the 9th-10th centuries) sources make it possible to trace the history of only certain elements that later turned out to be inherent in European plows and plowing.

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Thus, from Xenophon's report that the plowman turns the earth with his tools so that the sun warms its deep part and burns out the roots of the weeds [Hen., Oekon., 10, 12], it does not follow at all that "in the 5th century BC i.e. together with the plough, there was already a primitive plow" [Origin and development of agriculture [Origin and development of agriculture, 1967, p. 104-105]. Flipping the blade could be achieved with an ordinary plow by tilting the tool to one side. The idea that the "primitive plow" still had no shelf board,

but with a specially made rack that made it possible to turn the plow in one direction, is depicted on an ancient Roman statuette from Telamone [Sergeenko M.E. 1958, p. 45], seems to be weakly substantiated: there are no real finds of such tools, we do not know of analogies for them in ethnographic material, and a small bronze statuette can hardly say anything specific about such features of the structure and functional purpose of the tool. All other data, without a doubt, indicate that ancient Greece and Roman Italy knew only different types of ral.

With a strictly critical approach, it is insufficient to substantiate the thesis about the appearance of the plow at the beginning of AD. the well-known notice of Pliny the Elder about the plowing tool known in Gallic Rhetia under the name *planmorati* or *planmaratimi* [Plin., Hist. Nat., XVIII, 172], although it is often interpreted precisely in this way [see, for example, [Sergeyenko M.E., 1958, p. 51-54]. The mentioned message is extremely laconic, moreover, it may have been distorted by later scribes. If we stay within the framework of the information given by the text itself, Pliny imagines the *planmorati* as a heavy wheeled implement, to which two or three bullocks were harnessed, and which had a broad spade-shaped tip, presumably symmetrical, and was used for cultivating fields that were under steam.

There is no data on shelf accessories for this tool. Whether it was a plow with a one-sided shelf, a heavy wheel plow with symmetrical shelf devices, or without shelves at all - it is impossible to find out from the text of Pliny. There are no other reliable data on the use of plows in Italy or the northern Roman provinces, and the notion that there is a "Roman plow" seems to be poorly founded².

Appearance at the border of n. e. plowing tools with wheels is confirmed by archaeological findings of chains connecting the plowshare with a two-wheeled front, in the territory of Norica and Pannonia, in complexes of the Late Late Latin and Roman times [Gabrowec S., 1955, tab. I, 3; V. Bratanic, 1954,

fig. 12, 15; 1960, p. 95]. In part, these finds are earlier than the reports of Pliny. They are attributed to the Celtic or Celto-Illyrian population. About the wheeled plow implements used in some regions of Europe in the IV century. N. e., says the commentator Pliny Servius [Servius, Comm. in Verg. leorg., I. 174]. In documents from the territory of France starting from the VIII century. the word "saggisa" is found, which, judging by the context, denotes a heavy wheeled plowing tool, which was different from the usual plow, called "aratrum" [Lex Allemanorum, 96; Poliptique de Tabbuje Saint-Germain, 22, 4; Capitnlare de villes vel cnrtis imperii, 23]. The modern French word charrue - plow - comes from the term "saggis". English documents of the IX century. know this term in the form "saggucatum" [Haudricourt AG, Delamarre M. J.-V., 1955, p. 348]. The mentioned sources do not give sufficient grounds to consider the plowing implements carruca and carrucatum as plows: they could also be wheel plows.

The history of the term "plough", common in many European languages, primarily Slavic and Germanic, is equally insufficient for an unambiguous solution to the issue³. The etymology of this word has not yet been precisely established [Kiparsky V., 1954, p. 258, 259]. Existing points of view about Slavic or Proto-Slavic [see eg: Inglot S., 1949, p. 125; Machek K., 1951, p. 207], as well as about German [see, for example: Janko J., 1909, p. 105; Holub J., Koresnu F., 1952, p. 240] of its origin can be considered as hypotheses that have an equal right to exist. K. Moszynski [K. Moszynski, 1956, p. 1-6] it was suggested that in ancient Germanic languages this term is related to the name of the ploughing-tool *plaumorati* mentioned by Pliny. He attributes the last term to the pre-Germanic languages of Central and Southern Europe, possibly Celtic or Illyrian, and interprets it as "ploughshare (in the sense of a plowing tool) placed on wheels." From the same source, the word "plough" could have entered the Slavic languages. If this hypothesis is correct, then the word "plough" was originally identical in meaning to the terms "saggis" and "carrucatum", denoting

primarily a wheeled plowing tool.

Regardless of the etymology, the presence of this word in similar forms in all Slavic languages may indicate the spread of the corresponding tool during the era of Proto-Slavic unity, i.e., presumably, before the VI century. N. e. The oldest mention of the term "plough" in written sources (in the Latinized form "plovum") was found in a Lango-Bard text from Northern Italy at the end of the 6th and 7th centuries. [Moszynski K., 1956], in documents from the territory of Germany (in the form of "Pflug") it has been used since the XI century. [Lamprecht M., 1886, p. 331], in Old Slavic sources it is recorded in the "Tales of Time", a monument of the 12th century. [Povest vremennykh let, vol. I, p., 58], in Czech and Danish sources - from the XII century. [Judicka J., 1957, p. 257, 259], Polish - from the XIII century, English - from the turn of the XII-XIII centuries. [Haudricourt AG, Delamarre M. J.-B., 1955, p. 349], it would be tempting to talk about the age of the plow as a tool specially designed for one-sided plowing, based on the time of the appearance of the term in question.

However, the names of plowing tools tend to move from one object to another, and we cannot be sure that a plowing tool called a plow in the middle or second half of the 1st millennium AD was functionally identical to a later plow. Plows could originally be called wheeled plows, which K. Moshchynsky's proposed etymology of this term and the origin of the French word "saggusa" seems to indicate⁴. This can be evidenced by the great similarity of terminology in Slavic languages, which refers to the parts of the plow [Podolak 1957]⁵ and the features of plow plowing [Bratanic V., 1954]: the commonality in the names refers primarily to those parts of the plow that are also present in the wheel harrow, and the similarity in the terminology related to plowing could appear even before the appearance of the plow, since one-sided plowing under special working conditions could also be carried out with a plow.

As already noted in the previous chapter, one cannot agree with attempts

to prove the existence of a plow in the first half of the 1st millennium AD. e. by references to archaeological finds of small, weakly asymmetric tips of plowing tools and combs.

To prove the appearance of the plow in the north of Europe in the first half of the 1st millennium AD. e. sometimes use the known finds of plowing tools from the peat bogs of Tommerby, Aldeberg and Vilersø in Denmark. Their reconstruction as a tool with a wheel front, comb and one-sided shelf [Strensberg A., 1937, fig. 4; Glob PV, 1951, fig. 4], although possible, is nevertheless based on too small fragments and cannot be considered unambiguous, and the dating to the early Iron Age (no later than 300 AD) has long been disputed. Radiocarbon analysis of these finds gave a later date: the end of the 1st millennium AD. e. [L. Steensberg, 1955, p. 471].

Thus, the sources of the 1st millennium AD available at our disposal. and earlier times do not allow us to unequivocally resolve the question of whether a real plow was used anywhere in Europe at that time. The presence of plow implements with a one-sided shelf, the most important feature of the plow, which was made of wood for a long time, and therefore was not preserved in the archaeological material, can be said with confidence only from the X-XI centuries. and only on the basis of iconographic data⁶. The same sources make it possible to believe that wheel plows were also widely used at that time along with plows.

Traditional plows, used in the recent past by the peoples of Eastern Europe, had a one-sided shelf, which was occasionally rearranged, in most cases - a fixed right-sided one, as a rule, they were equipped with a two-wheel front and shank, asymmetric plowshares, in Ukraine - in the form of a rectangle, and among the peoples of the Volga region - often in the form of an equilateral triangle. Symmetrical plowshares were rarely used, usually in plows with an adjustable shelf. There were significant differences in the size of tools, their

plowshares and combs, and the number of draft animals [Naydych D.V., 1967, p. 51]. All plows were significantly larger than the ralf used in the same areas. Significant differences were observed in the structure of their body.

The simplest and closest to plows in terms of construction were plows with a single skid, one handle and a straight share (Fig. 2, 1). Their skid was a wooden beam, slightly wedged in the front part. At its rear end, a handle bent back was hammered, often in the form of a natural antler, i.e. bifurcated. Below the bifurcation, a straight shaft was inserted into the handle. There was a rack between the shaft and the skid. Such plows were usually equipped with a symmetrical share and a one-sided adjustable shelf, made in the form of a narrow board, which was attached to the rack with a hook. In their structure, it is easy to see an almost complete similarity with straight-shaft rales of four-element construction. They were known in Prykarpattia, in Bukovina and the north of Moldova [Demchenko N.D., 1968, p. 61, fig. 21, 2; Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, p. 45, 46, tab. V, 2; VII, 2], were widely used in Central and Western Europe [see, for example: Leser R., 1931, fig. 6, 8, 142; Podolak J., 1956, fig. 6, 14; Urbanzowa W., 1960, fig. 28].

Plows with a single skid, two handles and a straight share were more complex in structure (Fig. 2, 3). Their skirt was asymmetrically tucked in the front and had a semi-oval cut in the back. Two handles bent back were inserted into the rear part of the slide, which were connected by a crossbar. The left handle was thicker than the right. In it, at a certain height from the skid, a hole was made for the boom. The rack was attached approximately in the middle of the slide, to the left of its axial line. Such plows always had a right-sided fixed shelf and an asymmetric share. The front end of the shelf was attached to the rack, the back - to the right handle. These plows should be considered genetically related to the one-handled plows described above. They were known in the west of Ukraine [V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi, 1971, p. 45,

46, tab. V, 3, 4] and in Moldova [Demchenko M.D., 1968, p. 60, fig. 17, 5, 7], as well as in many areas of Central and Western Europe [Leser R., 1931, fig. 18, 43, 81, 82] and others.

The construction of plows with a double skid, which was one whole with the handle, and a curved share was fundamentally different (Fig. 2, 2; Fig. 68). The frame of the plows of this variety, the most representative in Eastern Europe, consisted of two solid structures, the lower part of which, being connected together, served as a skid, and the upper part was

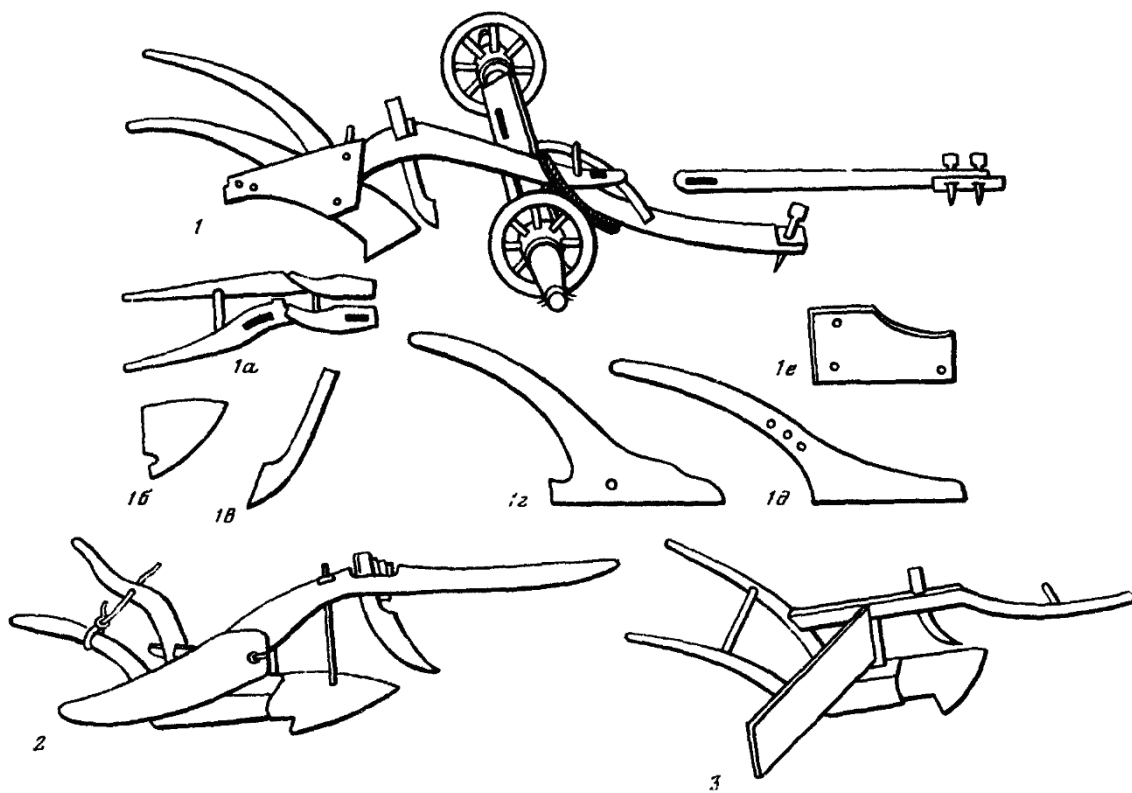


Fig. 68. Different variants of Eastern European plows:

1-traditional Ukrainian plow of the second half of the 18th century. and its details, according to L. Gldenstedt: 1a- handles, which turn into details of the slide; 1b- ploughshare; 1c- comb; 1d and 1d-handle with details of the slide, view from the outside: 2- saban from the Middle Volga region (according to H.

Firstov); 3- Ukrainian plow of the second half of the 18th century from the Yelets province (according to D.V. Naidych) two independent handles (Fig. 68, 1a, 1d, 1d), a shaft curved in the horizontal and often in the vertical plane, a rack connecting the left part of the double slide and the shaft. Their most important feature, which distinguishes such plows from the ones described above, concerned the structure of the skid, which was double, and the handles, which were one whole with the parts of the double skid. In an effort to make the slide wider, an additional bar was often laid between its parts, and all parts were fastened from above with a crossbar. This was the structure of the plows, which were called traditional Ukrainian or "classic" plows and they were distributed throughout the territory of Ukraine [Güldenstedt A., 1804, p. 7 - 12, tab. II; V. Friebe, 1808; Scott A., 1850; D. Zelenin, 1907, p. 83-87; Poltava State Museum, 1928, p. 71-75; Bezhkovich O.S., 1931, p. 85; Gorlenko V.F., Boyko I.D., Kynytskyi O.S., 1971, p. 46 - 54, tab. V, 5; VII, 3, 4]. Parts of the slide and handle were made from separate parts only in those cases when the master did not have the appropriate material at his disposal [Mamonov V.S., 1952, p. 80]. The basis of such plows allegedly consisted of two single-handled straight shaft plows, which were united by one tip.

The considered plows also had peculiarities in the structure of the shaft. It was a long (up to 2.8-3 m) and relatively thick (up to 10-12 cm) birch or aspen log, thinned to the front. At a short distance from the rear end, the shaft was bent upwards in the vertical plane, a little further - towards the "field", i.e. to the left in the horizontal plane [Mamonov V.S., 1952, p. 80]. The bending of the harrow in the vertical plane facilitated the plowing of lands with thick grass cover: in this case, the raised sod did not clog the space between the comb, harrow and skid. In addition, such a bend made it possible to place the place of application of traction force lower. The degree of bending of the shaft in the vertical plane in Ukrainian plows was different, in plows of small sizes - very small

[Mamonov V.S., 1952, fig. 15]. The bending of the shaft in the horizontal plane ensured the location of the comb parallel to the field side of the asymmetric plowshare. The rear end of the shaft was inserted into the left handle.

The so-called Ukrainian plows, the few descriptions of which refer to the first half and middle of the 19th century, had the same base structure. [Bunin N., 1836, p. 233; Tsvetkov II., 1859, p. 50, 51; D. Zelenin, 1907, p. 139-144]. D.V. Naydych sees the differences between Ukrainian and Ukrainian plows only in smaller sizes and a higher location of the point of attachment of the traction force [Naydych-Moskalenko D.V., 1959, p. 44], due to which their shaft is almost straight (see Fig. 68, 3). The presence of a double blade, the component parts of which form one whole with the handles, can be traced in the majority of single-bladed sabans, traditional plows of the population of the Middle and Lower Volga region (Fig. 68, 2). In the earliest descriptions of sabans of the 18th century. [P.S. Rychkov, 1758; Daily notes. ..., 1771, p. 126, 127; Pallas PS, 1801, p. 8, 65, 66] we see plowing tools with combs, asymmetric plowshares and a right-sided fixed shelf, the basis of which was two parts combining the functions of two parts of the blade and the handles. Heavy sabans of the first half and middle of the 19th century. According to the general scheme of construction, they practically did not differ from "classic" Ukrainian plows. Differences were noted only in the shape of the ploughshare, which most often had the shape of an equilateral triangle among the Sabans, in size, in the greater curvature of the shaft in the vertical plane, in some details of the structure of the tip [Firstov G.V., 1954a, 1954b; D. Zelenin, 1907, p. 54; N.A. Khalikov, 1981, p. 56-59, fig. 8]. The Sabans of the Crimean Tatars had practically the same structure [Mamonov V.S., 1952, fig. 20] and Bashkir [Yanguzyn R.Z., 1968)]7.

Plows with a double skid, the parts of which are one whole with the handles, were spread, thus, mostly on the territory of Eastern Europe: among Ukrainians, Ukrainians, Moldovans, and the non-Ukrainian population of the

Volga region and the Black Sea region. Beyond these limits, their use is recorded in the eastern regions of the Czech Republic [Urbanzowa W., 1960, fig. 39] and in the north of the Balkan Peninsula [Moszynski K., 1929, fig. 150; Leser R., 1931, fig. 119], where they were known along with plows that had a different body design.

We note another group of plows that were used in the 19th century. in the north-eastern regions of Eastern Europe by non-Ukrainian and less often Ukrainian population. We are talking about light one-plough plows and so-called "ploughshares" [Zelenin D., 1907, p. 96-100; D. V. Naidych, 1967, tab. VIII, 4; XVI, 3, 4; N. A. Khalikov, 1981, fig. 9, 12, 2]. These small implements, drawn by one or two horses, two-wheeled at the front, sometimes without wheels, had a fixed shelf on one side, so that they should be classified as plows. Some of them are without brushes. In this case, the left side of the ploughshare was bent upwards, forming a kind of incisor. The basis of such plows was a single unitary structure that combined the functions of the skid and the handle (Fig. 69). The latter was sometimes bifurcated, the shaft - both straight and curved. In terms of the structure of the skid, they practically did not differ from straight-shaft hand-operated plows. The blades of such plows were both symmetrical and asymmetrical. The first sometimes had a rounded working edge.

Traditional Eastern European plows were used under different agricultural systems: iron, fallow, various modifications of steam [Naidych D.V., 1967, p. 34 - 57; Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, p. 28, 29, 43; N.A. Khalikov, 1981, p. 29, 55, 71]. In the conditions of tripilla, smaller plows were used than those that worked on iron and fallow fields.

Data from written sources about Eastern European plows is fragmentary and in many respects uncertain. The first mention of a plow in literary sources is found in "Tales of Time", written around 1112, in that part of it, which tells

about the campaign of Prince Volodymyr of Kyiv to Vyatichi in 981. 58]. The term "plough" appears here as the name of the unit of taxation. This testimony is usually considered as an indisputable indication that in the X century. the plow was already a common plowing tool for Kyivan Rus [V.Y. Dovzhenok, 1961, p. 71; Kochin G.K., 1965, p. 42, 43]; from it, conclusions are made about the much earlier appearance of the plow among the Eastern Slavs.

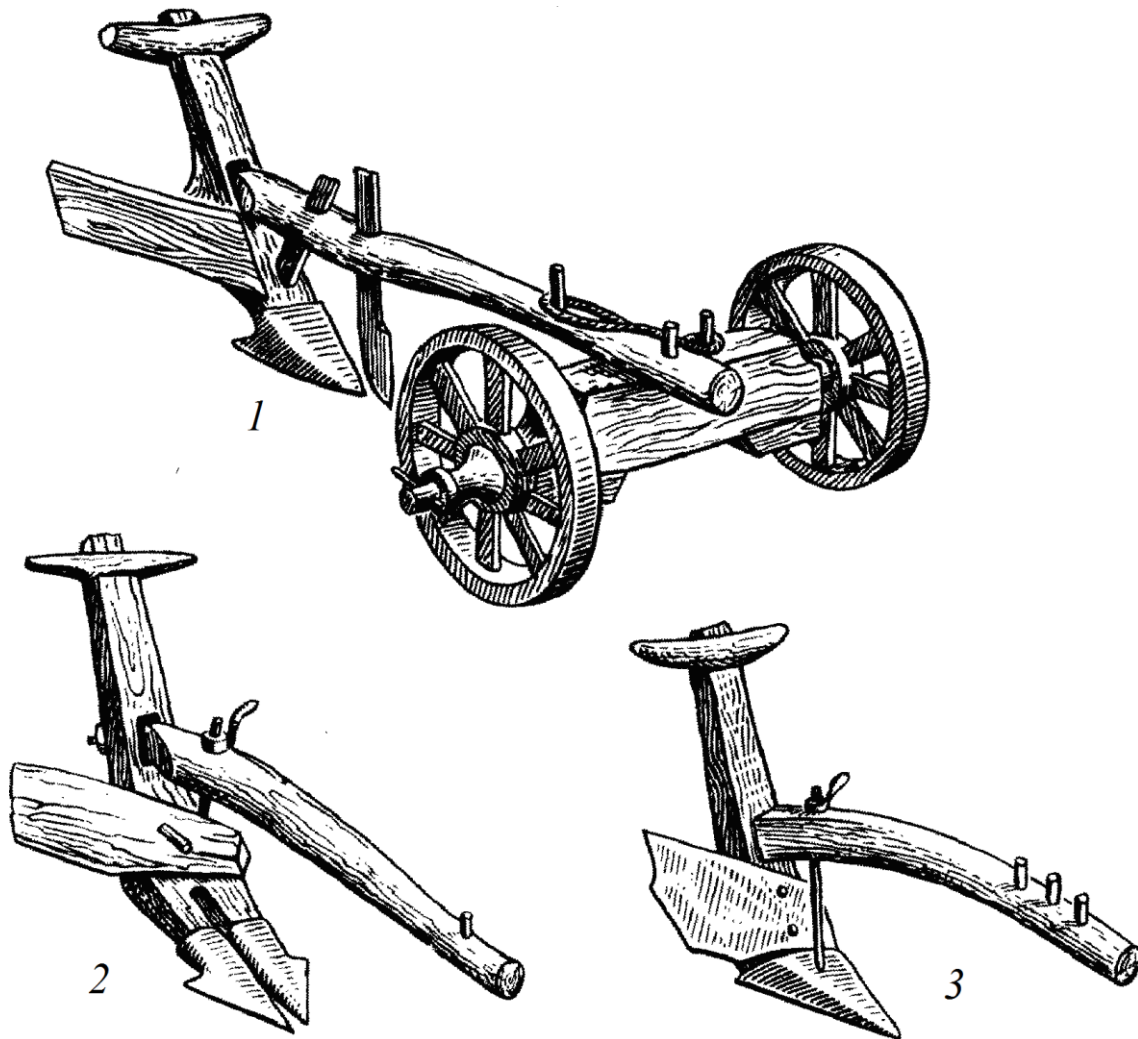


Fig. 69. Varieties of bridles of a single design, a handle-railnik (according to N.A. Khalikov):

1- "Kazan Saban"; 2-bladed plowshare from the Ufa province;

3- "half-saban" from the Ufa province

However, this interpretation can hardly be recognized as correct, in any case - the only possible one. Firstly, we are talking about a monument of writing not of the X, but of the XII century. Therefore, the chronicler could describe events that had long passed in the terms used at the beginning of the 12th century. Secondly, even if we attribute the first chronicle mention of a plow to the 10th century, it remains unclear which tool the chronicler had in mind: it has already been noted that the term "plough" could originally be applied to improved plows. In monuments of ancient Ukrainian writing, this word was often used as a translation of the Greek term *αρατρον*, which denotes a plowing tool in general, and primarily a plow [Sreznevsky I.I., 1903, vol. III, stb. 9]. Therefore, the Eastern Slavs used a plow in the 10th century. cannot be substantiated only by the given historical testimony and needs to be verified by other sources.

The plow, along with the harrow, is mentioned by another monument of the 12th century. - "Ukrainian Truth". In article 57 it is said: "Even if the master gave the plow and the harrow to him, let him dig the land...". Presumably, here the plow means a relatively expensive tool, which was different from the usual plow, which every peasant could easily make. However, this does not exclude the possibility that the instruction of "Ukrainiankaya Pravda" did not refer to a plow in our understanding, but to a heavy wheeled plow.

The term "saban" has a long history and is used in a number of Turkic languages to denote either a plowing tool in general or a tool equivalent to a plow. This term and a number of its derivatives were recorded for the first time in Mahmud Kashgari's "Couches of the Turkish Language", composed around 1072-1073 [Besim A., 1939-1941, vol. I, p. 402; Volume II; with. 214; Vol. III, p. 342, 416]. And in this case, we do not have sufficient data to consider this evidence as a clear indication of the use of the Turkic-speaking peoples of

Eastern Europe in the 11th century of a real plow, because the term "plow" means different tools in terms of functionality. The root "yg", "ik", "ek" is not the oldest in the Turkic languages, to which the Chuvash name of the plowing tool, in particular the plow - "aka", "akapus" goes [N.I. Ashmarin, 1929, with. 66].

In later written sources, the word "plow" occurs quite often and in different meanings: as an agricultural tool, a unit of taxation, a measure of land [see, for example: Sreznevsky I.I., 1903, vol. III, stb. 971; The life of Saint Sergius. ..., 1897, p. 90; GVNP, p. 39, No. 21; ASEI, p. 189-190, No. 260, 261; Tikhomirov M. Ya., 1941, p. 178-180]. In the Polovtsian dictionary compiled in 1303, the term "saban" is used in the sense of "field", "arable land", "plot". There are also derivatives of this term: "saban temir" (tip of a plowing tool, ploughshare), "sabanchi", i.e. farmer, plowman, etc. [Suun G., 1880, p. 8, 90, 180, 224].

At the end of the XIV century. the name of the plow appears for the first time in the land allocation formula [Sreznevsky I.I., 1903, vol. III, stb. 971], quite frequent in documents of the XV-XVII centuries. [Kochin G.E., 1865, p. 73]. "Ploughland" along with "arable" and "arable" land is mentioned in one of the court lists of the end of the 15th century. [Gorsky A.D., 1959, p. 26]. Occasionally, the word "ploughman" is recorded in documents, that is, plowman, farmer [Sreznevsky I. I., 1903, vol. III, stb. 971]. In the spiritual deed of Maria Petelina around 1400, "Tebenkovo pluzhishche" is mentioned [ASEY, No. 228] - obviously, a plot of land plowed with a plow.

All these data testify to the wide spread of plowing tools called "plow" and "saban" in many regions of Eastern Europe, and not only in the south, in the steppe and forest-steppe areas, but also in the forested North-East and North-West Ukrainiania. According to A.D. Gorsky, N.A. Gorska and H.K. Kochin, certain mentions of plows in documents of the 14th-16th centuries. are for the

following areas of the forest belt of Eastern Europe: Bezhetsk Verho, Vologda, Volodymyr, Halytsky, Dvina, Dmytrov, Dorohobuz, Zvenigorod, Kurmysh, Kostroma, Kolomen, Kashin, Meshcher, Moscow, Mozhai, Murom, Nizhnyhorod, Pereyaslav, Radonezh, Rostov, Rzhev, Suzdal, Ughlyt, Yuryiv, Yaroslavl counties, Poshekhony and Perm lands.

Very important for understanding what the plow was as a plowing tool are "Ukrainiankaya Pravda" and the charter of Veliky Novgorod about the "black bir" from the Novotorzh volosts [GVNY, p. 39, No. 21]. The first, as already discussed, gives reason to assume that the plow was a more complex and expensive tool than a plow and a plow, due to which large landowners gave it to dependent people for use and took a "kopa" for it. In the Novgorod document on "black bir", the authorities consider farms with a plow as twice as powerful as those with only a plow ("a plow for two ploughs"). Here, obviously, the greater productivity of the plow and the fact that the plow required more traction than the plow were meant. Therefore, it could be used only in the farms of wealthy farmers [Kochyn G.E., 1965, p. 73, 74].

However, written sources say very little about the structure of the plow and its functional features, moreover, only for the 16th - 17th centuries. From the details of the plows, the sources mention "plow wheels", "ploughshares", "ploughshares", "ploughshares", sometimes paired ("two-pair plowshares"), that is, obviously, a plowshare and a comb [Horskaya N.A., 1959, p. 143, 147. 151, 157]. Plows were made by special craftsmen and bought even in large monastic farms, which indicates their considerable complexity. Of considerable interest is the mention in the deed of departure of 1522, which belongs to the Pereyaslav county, of a "plow structure" - a deep furrow that served as the boundary of this metropolitan and patrimonial land [AFZyH, 1951, vol. I, p. 13, No. 1a]. The very name of its "composite" indicates a specific feature of the work of the plow of the 16th century. felling, "folding" of the raised ridge to one side. Both bulls

(oxen) and horses were used as draft power for plowing. In the Novgorod steering wheel of 1280, the plow is mentioned in a team of two oxen [Sreznevsky I.I., 1903, vol. III, stb. 971]. In monastery documents and documents of great patricians of the late 15th - early 17th centuries. from the regions of North-East and North-West Ukrainiania, oxen are repeatedly mentioned, which, undoubtedly, were used not during plowing with a plowshare, which was at that time the main plowing tool of the peasant economy, but with a plow [Y.A. Gorskaya, 1959, p. 157, 158; Kochyn G.E., 1965, p. 255, 256].

The totality of these meager and fragmentary data still allows us to say with confidence that plowing tools, called plows and plowshares, were used in a number of regions of Eastern Europe at least from the XI-XII centuries, that they were larger, more complex and more productive tools than plow and plough. Until the 16th century plows spread over most of the Ukrainian Empire, in particular in forest areas. They had a wheel front, a ploughshare, often with a weld on the working edge, a comb, a one-sided shelf, which is indirectly evidenced by the mention in the documents of characteristic plow furrows.

Iconographic materials on the history of Eastern European plows are very few. The earliest image of a plowing tool, which can be considered a plow, and the earliest image of an Eastern European plowing tool in general, is presented on one of the miniatures of the Radziwillovsky or Königsberg Annals [Radzivillovskaya or Königsbegskaya letopisy, 1902]. The surviving copy comes from the Smolensk or Novgorod lands and dates back to the end of the 15th century. A convincing assumption is that the Radzyvilliv chronicle is a copy of an earlier personal chronicle compiled in the Volodymyr-Suzdal land around 1216 [Shakhmatov A.A., 1902, p. 30, 103]. Many of his miniatures show archaic features dating back to pre-Mongol times [A.V. Artsykhovskiy, 1944, p. 14-16]. The miniature with the image of the plow may also resemble the original

of the first quarter of the 13th century. [V.Y. Dovzhenok, 1961, p. 71; Chernetsov A., 1972, p. 36, 37].

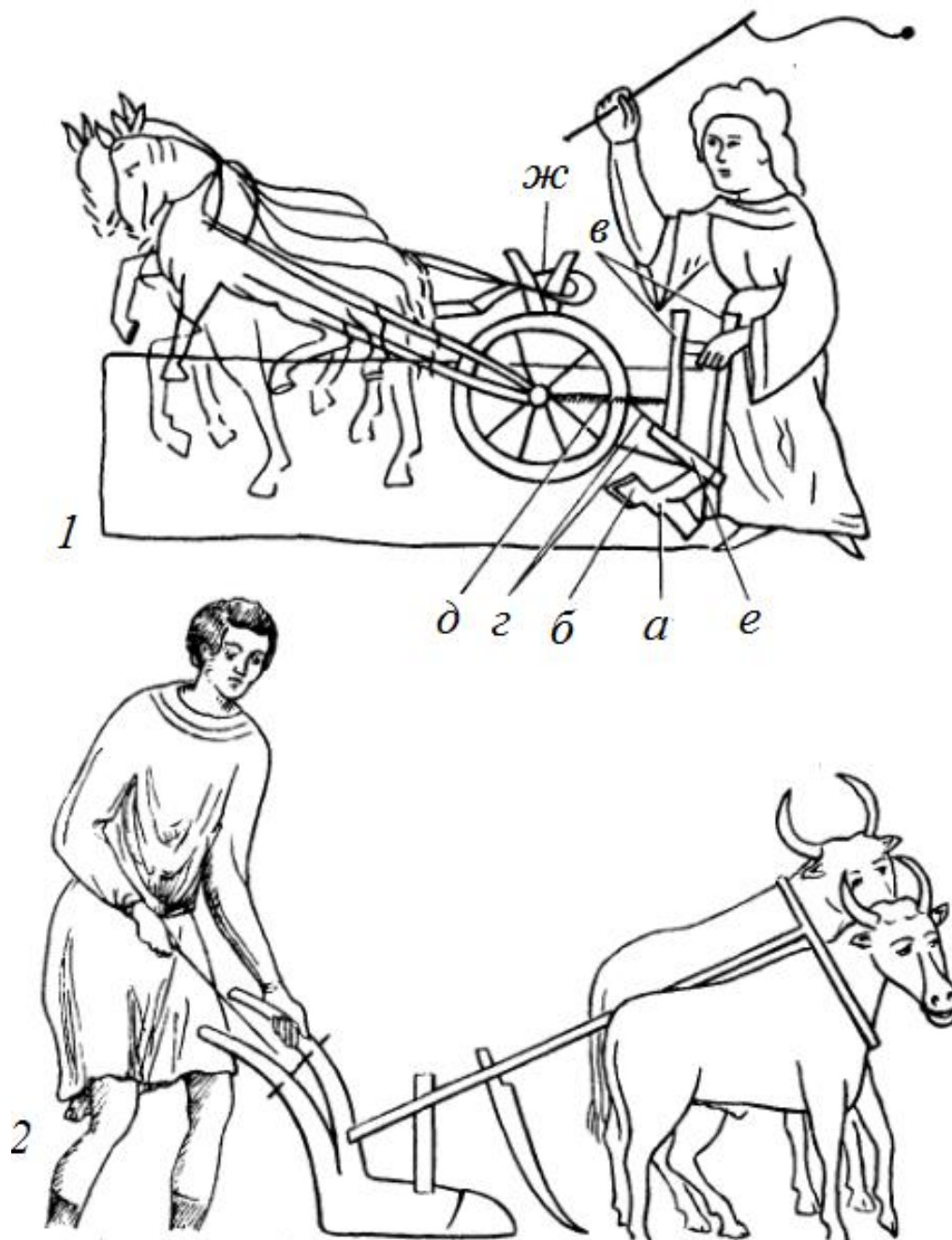


Fig. 70. Medieval Eastern European plows:

1- based on the minpature of the Radzivilov Chronicle; 2- from the painting of the Voronetsky Monastery; a-slide (working part); b-plow; v-handle; d, d - possible variants of the image of the shaft; e-shelf; w-a device for holding turrets

with. 224, 225] sees a plow with a one-sided shelf in the plowing tool of the Radziwill Chronicle. V.P. Levashova [V.P. Levashova, 1956, p. 34] and V.Y. Dovzhenok [V.Y. Dovzhenok, 1961, p. 77] consider it a plow.

The miniature of interest to us (Fig. 70, 7) has been repeatedly studied with the aim of reconstructing the plowing tool depicted on it [Artsykhovskiy A.V., 1944, p. 24, 25; V. Ya. Levashova, 1956, p. 34; V.Y. Dovzhenok, 1961, p. 77; Chernetsov A.V., 1977; Podwinska Z., 1962, p. 224, 225]. All authors are unanimous in attributing it to those tools that were called plows in Ancient Ukrainiania. However, the known conventionality of the image, the mistakes of the artists who worked on it and corrected each other, the fact that the image was probably copied from an earlier original - all this complicates the interpretation, leads to different understanding of the details depicted in the drawing, ultimately - to various reconstructions of the ancient Ukrainian plow. Yes, A.V. Artsykhovskiy [Artsykhovskiy A.V., 1944), and after him A.V. Chernetsov [Chernetsov A.V., 1972, 1977) considered this tool as having a double symmetrical shelf, i.e. as a heavy wheeled plow. Z. Podwinska [Podwinska Z., 1962, p.

The diversity of judgments forces us to once again turn to the analysis of this image.

In our opinion, the miniature clearly shows the working part of the plow tool, which forms a horizontal skid, shown in the figure as double (Fig. 70, 1a). In the front part, its component parts are connected together, and an iron tip is put on them. In the rear, these parts are shown diverging. As already mentioned, this design of the skid is characteristic of most plows known in Eastern Europe from ethnographic materials. An increase in the distance between the parts forming the skid in its rear part is just as significant as in the considered miniature, for example, in the Mordovian saban described by I. Lepekhin [Dnevnye zapiski ..., 1771, p. 126, 127; the drawing of the saban is reproduced:

Leser R., 1931, fig. 65-67], or the "Little Ukrainian" plow used in the XIX century. in the Samara province [Naydych D.V., 1967, p. 51, fig. 10]. The interpretation of this detail by A.V. Artsykhovskiy and A.V. Chernetsov as a double shelf seems illegitimate. With this interpretation, it turns out that the shelf boards are attached directly to the iron tip, which is not found in plows. Finally, the shelf in the thumbnail is there, but it is depicted elsewhere, which will be discussed below.

A clearly visible and rather large iron tip is attached to the front end of the slide (Fig. 70, 1b). The general features of its shape are transmitted by the miniaturist - a wide symmetrical blade and a narrower back part where the sleeve is located. Near the edges of the working part - parallel dashes, which probably transferred the welding along the working edge of the tip. A.V. Artsykhovskiy considered them as a designation of the iron fitting of a wooden rail. This is hardly legitimate: in this case, we have to assume that the skid had a rhomboid shape, which is never found in plowing tools.

The picture clearly shows two handles (Fig. 70, 1c), which are connected in the upper part by a crossbar. Assumptions of A.V. Artsykhovsky, that the plow of the Radziwill chronicle had only one handle, and the second (right) is a comb incorrectly copied from an earlier drawing, can hardly be accepted. The fact that both handles are connected from above by a clearly visible crossbar speaks against this. The handles are depicted as straight, standing vertically. This is, of course, an artist's mistake: the handles of plows and plows were always bent back to a greater or lesser extent. Errors of this kind are sometimes found in the least realistic medieval depictions of plowing implements. The left handle in the miniature adjoins the lower end of the left part of the bifurcated slide, but does not connect with it, the right one does not coincide with the right part of it and is placed slightly in front of its rear end. Here, one should probably see a significant distortion of the actual state of things, and the miniature does

not give a clear idea of how the handles were connected to the slide.

It is difficult to say how the gryadil is depicted in the miniature of the Radziviliv annals. On the contour drawing of the tool, there are two dashed lines connecting the rim of the wheel with the lower ends of both handles (Fig. 70, 1d). These lines were not painted over when coloring the picture. A.V. Chernetsov suggests that one of these lines should be considered as the image of the girder. Then the shaft was connected to one of the handles (the connection of the shaft to both handles [see: V.I. Levashova, 1956, fig. 2, 2] is technically unlikely and has no analogies) very low and, as a consequence of this, it should be curved in the vertical plane, as is characteristic of Ukrainian plows and plowshares. However, during the final refinement of the drawing, a yellow line was drawn from the axis of the wheel to the middle of the right handle, which was not in the outline (Fig. 70, 1e). It seems to us that it is better to consider this well-defined and clearly visible line as the girder in the final version of the image. Then the considered tool should be characterized by a relatively high connection of the shaft with the handle, which is typical for Ukrainian plows of the XVIII - XIX centuries, and the shaft itself could be straight. No matter how we look at the image of the plowshare in the plowing tool of the Radziwill Chronicle, it is quite clear that its design was asymmetrical: the plowshare was attached to one of the handles of this two-armed tool, which suggests the presence of a one-sided fixed shelf.

A little above the rail and almost parallel to it, another detail is depicted in the miniature, which partially covers the lower parts of both handles and goes beyond their limits to the right and left. It seems that it is this part, which is clearly visible in the drawing, and should be considered as a single-sided shelf (in this case, the left-hand one, which corresponds well with the attachment of the shaft in the right-hand grip). The shelf is depicted as a rather long and narrow board (Fig. 70, 1e). Images of a one-sided shelf similar in shape and

location are on medieval Western European miniatures [Müller S., 1902, p. 30, fig. 3; Leser R., 1931, fig. 20, 32; etc.]. Plows with a left-hand shelf are also not uncommon in medieval iconography [Müller S., 1902, fig. 3; Brandt R., 1927-1929, vol. 1, fig. 274, etc.]. In part, this is a reflection of the actual features of the tools, but often it is only a convention of the image or an artist's mistake [Haudricourt AG, Delamarre M. J.-B., 1955, p. 20-24]. In the ethnographic material of Eastern Europe, in contrast to Central and Western, plows with a left-sided shelf are not recorded, and among the asymmetric plowshares from archaeological materials, there are no left-sided plows. This circumstance forces us to treat with great caution the particularity of the plow in the Radziwill Chronicle and consider it, most likely, a convention of the image or an artist's mistake.

It is obvious that the rear end of the shelf board was attached to one of the handles, on the considered miniature - to the left. Its front end, judging by the ethnographic parallels, had to be attached to the rack between the slide and the shaft. The latter is not shown in the miniature, although the plow must have it. The location of the front end of the shelf board - between the slide and the beam approximately above the middle of the length of the latter is completely consistent with this assumption. Similar shapes and arrangement of the shelf board are known, for example, in the plow of the 18th century. from the Chernivtsi Museum [V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi. 1971, tab. V, 1].

The drawing of the plow shows only one large spoked wheel. Obviously, this is a convention of the image, which is often found in medieval Western European iconography. The plow itself had to have a two-wheel front: this is evidenced by the image of the device for supporting the turrets (Fig. 70, 1g). It has the appearance of a simple fork and finds analogies in Eastern European ethnographic material [Naydych D.V., 1967, tab. VII, 7]. In Western European

iconography, similar devices, but of a more complex design, are known from the 12th century. [Haudricourt AG, Delamarre M. J.-P., 1955, fig. 146].

The plow in the miniature of the Radziwill Chronicle is shown in a horse-drawn carriage. It is difficult to say how many horses are pulling the tools in the drawing - two or three: their contours intersect and were drawn, apparently, by two artists who supplemented and corrected each other. The figure shows a dove going to the wheel axis. Such a harness is rarely recorded in ethnographic data and only in light plows [Firstov G.V., 18546, p. 36].

The comb is missing in the picture. It is difficult to say whether this fact reflects a real feature of the tool or is an oversight by the artist. In any case, in Eastern Europe in the recent past there were occasional plows without brushes, which were used for work on soft, old arable soils.

Thus, from a functional point of view, the considered tool was a plow - a tool with a one-sided fixed shelf. A symmetrical plowshare does not contradict this: ethnography knows examples when plows with a one-sided shelf were provided with plowshares of this kind. From a constructive point of view, the plow of the Radziwill Chronicle was two-handled, with a shaft attached to one of the handles. This design is adapted only for one-sided plowing. If the image dates back to the first quarter of the 13th century, which there seems to be no reason to doubt, then it is the earliest image of a plow of this design in Europe: in the West, plows with such a feature of the body structure are recorded in miniatures only from the 14th century. An important feature of the plow of the Radziwill Chronicle, which brings it closer to most Eastern European "ethnographic" plows, is the presence of a double blade.

For the reconstruction of medieval Eastern European plows, the depiction of the plowing scene on the painting of the Voronet Monastery in Romanian Moldavia, made in 1547, is of interest [Voronets A, 1959, p. 6, fig. 97; Neamtu

V., 1966]. The tool shown here is two-handed, with a massive slide, on the front end of which an iron tip is attached (Fig. 70, 2). The two handles were obviously not separate parts. In the latter case, as is well known from the ethnographic material, the handle was inserted not at the very end of the slide, but slightly receding from it [see, e.g.: Demchenko N.D., 1968, fig. 17, 5, 6; 25]. This feature of plowing tools was invariably emphasized by medieval miniaturists [see, for example: Brandt R., 1927 - 1929, vol. I, fig. 193; Agriculture. ..., 1936, fig. 55; etc.]. In the image in question, the slide is shown as passing directly into the handles. This gives reason to assume that the blade of the tool from the painting of the Voronetsky Monastery was double, as is characteristic of most Eastern European "ethnographic" plows, and each of its parts was at the same time one whole with the handles.

The latter in the drawing under consideration are significantly bent back and connected by a thin, possibly iron crossbar. The shape of the blade is not visible in the plan. In longitudinal section, its blade is shown with a characteristic bent downwards, which is typical for the tips of plowing tools that worked in a horizontal position. The weapon had a long straight shaft, the rear end of which was inserted into the left handle. The design of the tool shows, in this way, that it was intended for one-sided plowing, that is, it was a plow. The front end of the shaft is connected to a yoke placed on the necks of two bulls or oxen. There is a rack, the lower end of which is fixed in the left part of the slide, obviously in the left part of it. The plow has a slightly curved comb. There is no image of the shelf in the picture, but according to the described design of the case, it must be there, and the shelf is one-sided, fixed, one end was attached to the rack, the other - to the handle. Apparently, the artist deliberately omitted this detail in the drawing in order, as V. Neamts suggests, to give greater sophistication to the whole scene.

The plow from the painting of the Voronetsky Monastery was wheelless.

The assumption that wheelless plows were quite widespread in the Middle Ages is based on the considerable length of the shaft of traditional Eastern European plows [Potushnyak F.Ya., 1957, p. 219]. Of the ancient plows kept in museums, this was probably the plow from the village of Rootstocks in the Chernivtsi region. [V.F. Gorlenko, I.D. Boyko, O.C. Kunytskyi, 1971, tab. V, 1], which had a shaft about 2.6 m long.

Until the first half of the 17th century. belongs to the image of a plowing scene among the drawings of the "Teacher's Gospel", published in 1637 by the printing house of the Kyiv-Pechersk Lavra [Gorlenko V.F., 1964, p. 50].

The plowing tool shown here in a team of two bulls consists of two handles, the lower part of which, joining together, forms a horizontal double slide, a shaft and a post, and has a comb. The fact that both handles were one whole with two parts forming a slide can be seen quite clearly in the figure. The handles are bent back and connected by a wooden crossbar. An iron ploughshare is attached to the front end of the skid. The shaft is long, which is characteristic of traditional Ukrainian plows, but straight. The last circumstance suggests that the curvature of the shaft of Eastern European plows in the vertical plane is a relatively late phenomenon. The back end of the shaft is shown inserted into the right handle, the front end is placed on a regular wheel bar. The design of the tool is thus one-sided, typical of plows, which requires a one-sided fixed shelf. The tool shelf is also shown on the right. Obviously, the attachment of the shaft in the right handle is an artist's mistake. According to the chronology and features of the design, the "Teacher's Gospel" plow is the immediate predecessor of traditional Ukrainian plows known in ethnography.

Let us also mention the image of a plow on an icon from Central Ukrainiania of the end of the 17th century, kept in the State Tretyakov Gallery [Chernetsor A., 1972, fig. 10]. This image is not very realistic, so create some kind of clear idea about the Ukrainian plow of the 17th century. is not possible.

We can only note the presence of a two-wheel front, a ploughshare, possibly asymmetrical, and a shelf on the right, which makes it possible to say that we have a plow in front of us, and not another plowing tool.

Thus, the iconographic data make it possible to draw important conclusions: firstly, that already in pre-Mongol times, the plows used in Kyivan Rus had a one-sided fixed shelf and an asymmetric structure of the skeleton; secondly, that the most important feature of the structure of their base was the presence of a double slide, which was one unit with the handles. These features were characteristic of most Eastern European plows known from ethnographic data.

Archaeological data are of great importance for solving the questions of the origin and early history of plows. But here we have the question of identifying in the archaeological material those items that can reliably and unambiguously testify to the existence of this plowing tool, to its, so to speak, "archaeological signs". We noted above that neither the presence of combs, nor the appearance of a tendency to blade asymmetry in some tips of plowing tools, nor the presence of a wheel front can be considered as indisputable signs of the existence of a plow. Considering the fact that the shelves of plows in ancient times, as well as in the recent past, were made entirely of wood and have not reached our days for quite understandable reasons, obviously, another way is needed to search for signs of a plow in archaeological material.

In this regard, we note that numerous data relating to different regions of the European "plow zone" indicate that the plow has always differed from the plow not only in its ability to perform one-sided plowing with a turn of the scythe, but also in its larger size, which is related to its relatively high productivity, complexity in manufacturing, comparative cost. Based on this, by searching for "archaeological signs" of the plow, it is possible to distinguish among the mass of iron tips of plowing tools from archaeological materials such

that, on the one hand, they would be quite clearly different from plowshares and other tips, and on the other hand, by their size and the main thus, the proportions would be comparable to the plowshares of traditional plows and plowshares known in ethnographic material.

Such are only the tips that we have allocated to group IV (see Fig. 14 - 16). They are relatively heavy and massive, their blade is considerably wider than the oval in cross-section of the sleeve, in the longitudinal section it bends downwards, which indicates that they work in a horizontal position, they obviously belonged to larger and heavier tools than the plough. Only these tips can be compared in all main features with the plowshares of "ethnographic" plows and plowshares of Eastern Europe.

Indeed, the relationship between the main dimensions of "ethnographic" ploughshares, which characterize their proportions, do not go beyond the limits of changes in the same indicators for the tips of group IV, although the limits of changes of these values in "ethnographic" ploughshares will be smaller (see Fig. 40-41) . The latter circumstance indicates a greater standardization of the tips of fully formed plows of the recent past. The width of the sleeve in the plowshares of traditional plows and plowshares and tips of group IV partially coincides: in the former it is generally larger than in the latter (see Fig. 39). This is quite understandable in view of the general trend of increasing the size of the tips of plowing tools over time, which is particularly evident in relation to plowshares. In general, the upper limits of all dimensions of the "ethnographic" plowshares significantly exceed those characteristic of group IV tips, and the lower ones, with the exception of the sleeve length, approach the upper limits of these last ones (Fig. 71). But even a partial coincidence of sizes is quite symptomatic here.

All these features of the form, which are characteristic of the tips of group IV, also occur in the ploughshares of traditional plows and plowshares, but the number of tips with these or other features is different. Among the tips of group

IV, the majority are symmetrical, extremely rare in plows and plowshares of the XVIII-XIX centuries. Asymmetric ploughshares in the form of an equilateral triangle, which constitute a significant group among the tips of group IV, are also rare in ethnographic material. The vast majority of "ethnographic" plowshares from various regions of Eastern Europe have the standard shape of a right triangle: one side of the blade is parallel to the sleeve and more or less blunt, the other is pointed and often has an additional weld on the edge. Such tips are rare in archaeological material and belong to the very end of the period covered by archeology - the XV-XVII centuries. Tips with a rounded working end are rare in both archaeological and ethnographic material, and their distribution generally coincides and appears to be narrowly local. As for such details of the shape as the cross-section of the sleeve, the longitudinal section of the blade, in this respect the tips of group IV do not differ from "ethnographic" plowshares.

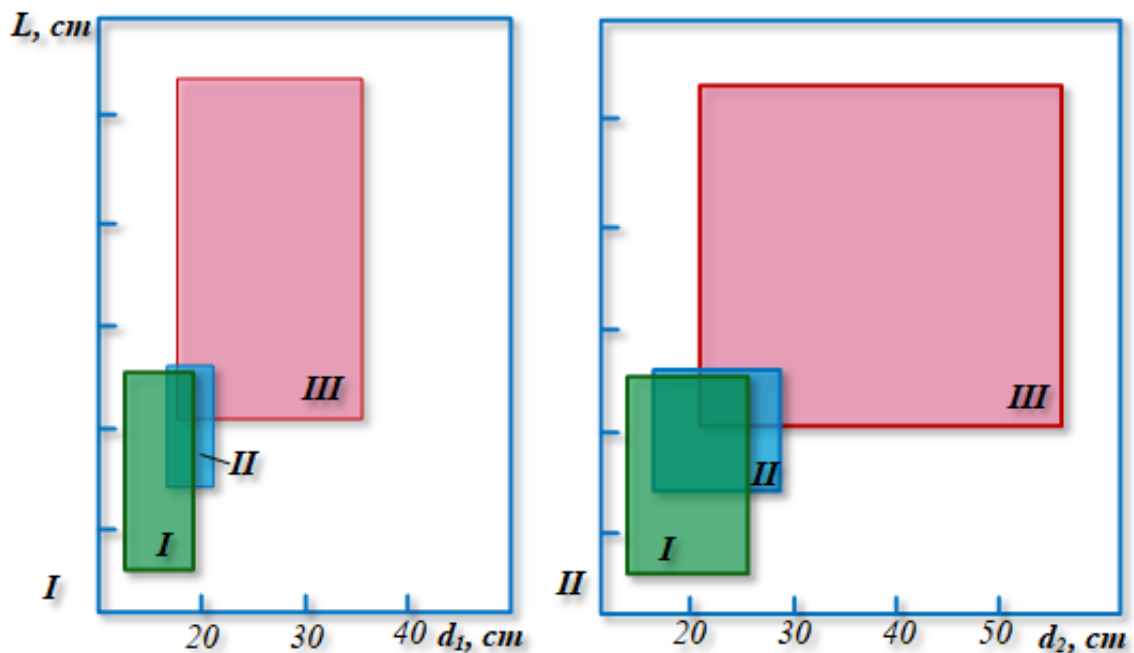


Fig. 71. Extreme limits of the absolute dimensions of plowshares:

AND, II - from archaeological materials (I - pre-Mongol period, II - the second half of the XIII-XVI centuries); III-from ethnographic materials

Attributing the tips in question to plows is not something new. As ploughshares, they have been considered for a long time, although without elaborate arguments. The novelty of posing the question in our presentation lies in the fact that we consider only group IV tips as working plow tips in the archaeological material.

As we already know, tips of group IV are divided into several types (see Fig. 29, 30), a genetic connection is established between the types of symmetrical and asymmetrical tips: symmetrical tips of type IVB1 are the predecessors of tips of types IVB4 and IVB6, and type IVB2 - tips type IVB5. Of the asymmetric tips, IVB6 type tips are closest to the plowshares of traditional Eastern European plows. Tips of type IVB4, which represent a fairly significant series in the archaeological material, differ from most "ethnographic" plowshares in that the left side of the blade is not parallel to the sleeve, and the right-sided asymmetry is less pronounced. But even at the end of the 18th and the beginning of the 19th century. plowshares of this shape were not so rare in some traditional plows. According to their proportions, the tips of types IVB4 and IVB6 are practically identical and close in this respect to the plowshares of "ethnographic" plows (Fig. 72). Their $L/d1$ and $L/d2$ ratios are within the same limits as those of plowshares from ethnographic materials, but half of the tips we measured have a slightly larger L/I ratio. This is due to the faster growth of the total length compared to the length of the sleeve, which is typical for tips that work in a horizontal position. The same small difference in proportions is found in symmetric tips of type IVB1, on the one hand, and asymmetric types IVB4 and IVB6 - on the other. Thus, a single line of development is outlined from the symmetrical tips of type IVB1 to the asymmetric ones of type IVB4 and IVB6, and through them to the tips of traditional Eastern European plows, a line of

gradual increase of all the main sizes of tips with a somewhat faster growth of the overall length and the greatest width of the blade⁸.

The differences in size between the tips of the considered types and the blades of traditional plows are quite significant. They are especially large in relation to the total length and the greatest width of the blade, smaller in relation to the width of the sleeve. However, late tips from archaeological materials (types IVB4 and IVB6) and here is a connecting link between symmetrical tips of type IVB1, on the one hand, and "ethnographic" plowshares - on the other. Simultaneous symmetric and asymmetric tips usually do not differ in size and proportions.

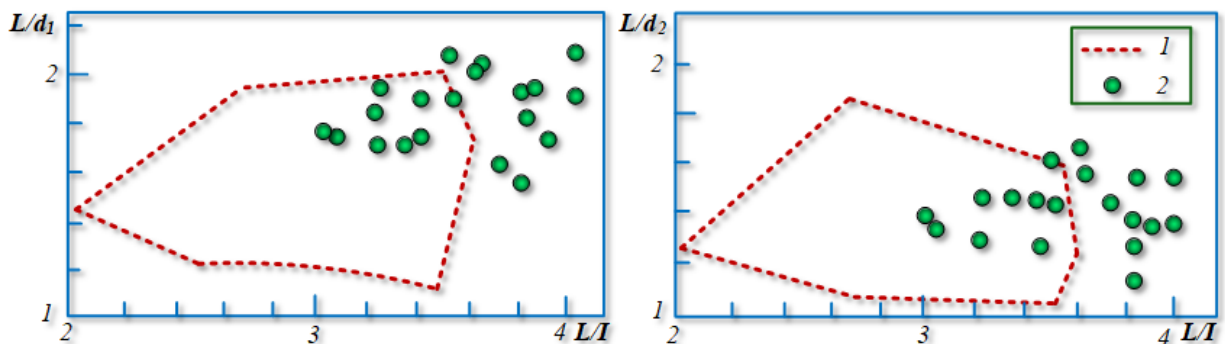


Fig. 72. Plow plowshares from archaeological materials of Ukrainian lands and ethnographic:

AND- correlation of the ratio of total length to sleeve width and total length to sleeve length; II-correlation of the ratios of the total length to the greatest width and the total length to the sleeve length; 1- the extreme limits of the specified ratios of plowshares from archaeological materials; 2 - plowshares from ethnographic materials.

Genetically related symmetric tips of type IVB2 and asymmetric tips of type IVB5, which differ from those discussed above in proportions and sizes, are

close to each other in all respects, differing only in the shape of the blade. There is no direct continuation of them in the ethnographic material: the plowshares of traditional plows and plowshares known to us have slightly different proportions, distinguished by a longer sleeve and, as a result, a smaller L/I ratio. It is interesting to note that this value in tips of type IVB5, generally later, turns out to be smaller on average than in tips of type IVB2. Thus, the general direction of development in time for tips of these two types is different than for tips of types IVB1, IVB4, and IVB6. The differences between these two series of tips, localized in different areas of Eastern Europe, seem to fade over time.

Tips of types IVB4, IVB5, IVB6, the asymmetry of the blade of which was clearly intentional, certainly belonged to tools with a one-sided (right-sided) fixed shelf, that is, to plows. The question of which tools corresponded to the symmetrical tips of group IV is debatable. It has already been noted that some researchers attribute them to tools that work symmetrically - heavy wheeled plows, which, in their opinion, were also called plows in Kyivan Rus. It is difficult to agree with such an opinion, if it is not supported by other facts.

Indeed, plows with a one-sided adjustable or fixed shelf and symmetrical plowshares are well known from ethnography. Such are some Slovak and Western Ukrainian plows [Podolak J., 1956, fig. 11, 14; Urbanzowa W., 1960, fig. 48; Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, tab. V, 2; VII, 2], Croatian Premetnjak, Hungarian valto eke, Belgian Kehrpflug, etc. [Podolak J., 1956, p. 71-73]. The authors had a chance to see a symmetrical ploughshare made at the end of the 19th century, which was used on a plow with a one-sided fixed shelf. Medieval Western European iconography testifies to the symmetry of the plowshares of early plows, which had a one-sided shelf [see e.g.: Müller S., 1902, fig. 3; Brandt R., 1927-1929, vol. II, fig. 19, LeserP., 1931, fig. 20]. Thus, the symmetry of the plowshare in itself cannot be sufficient evidence of the symmetry of the tool's operation.

There is every reason to assume that the asymmetric shape of the ploughshare could be formed only gradually, from the practice of working with a symmetrical ploughshare with a one-sided fixed shelf. Only in the practice of such work could the fact that the asymmetric ploughshare helps to dump in one direction the sliver of soil cut from the bottom and cut off with a comb from the side, be found and appreciated. Such a gradual transition from symmetric to asymmetric tips is clearly visible in the archaeological material. Weak asymmetry, about which it is not yet possible to say whether it was intentional, is recorded in some ploughshares from the Raikovets settlement, ancient Izyaslavl and some other monuments of pre-Mongol Kyivan Rus [A.V. Chernetsov, 1972, p. 144]. In this regard, the hoard of agricultural tools of the 14th century is interesting. from the village Old Orhei in Moldova [G.D. Smirnov, 1964]. Numerous tips of group IV were found here, which had different blade shapes according to standard sizes and proportions: both symmetrical and obviously asymmetrical, and one characterized by a different degree of transition from the first to the second.

The genetic connection between the symmetrical and asymmetrical tips of group IV, their great proximity, the same development in time for the series of their types, which differ in the proportions of the series of their types, are hardly consistent with the thesis that they belonged to different plowing tools: the first - rals, at least and heavy, equipped with wheels, the second - plows.

In connection with this issue, let's pay attention to one more circumstance. All tips of group IV, except for type IVB3, have an important feature in common: the average width of the sleeve in them is at least twice the average width of the sleeve of the divers used here (Fig. 73).

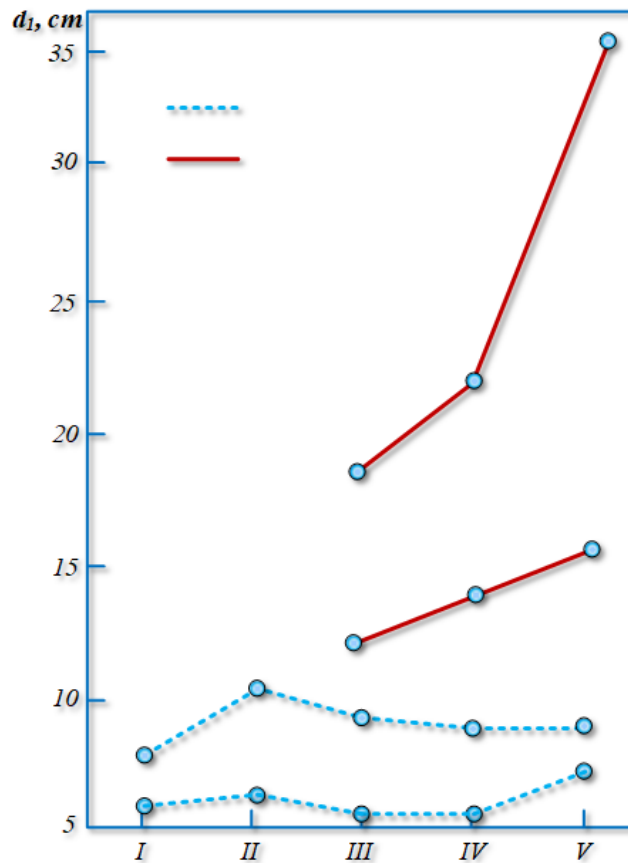


Fig. 73. Change of the minimum and maximum dimensions of the average width of the bushings of plowshares and plowshares in Eastern Europe:

1 - diving boards; 2 - plowshares I - the first half of the 1st millennium AD. is.; II - the second half of the 1st millennium AD. is.; III -X -XI - the beginning of the XIII century; IV - the second half of the XIII-XVI centuries; V - XVIII - beginning of XX centuries.

Thus, the average width of the bushing in group I tips, which worked in a position close to horizontal and were used in the area of medieval Eastern European plows, is 6-9.5 cm. In group IV tips, this value varies from 12 to 22 cm. the earliest tips of group IV have an average width of the sleeve, respectively: type IVB1 - 12-18 cm, type IVB2 - 14-19 cm. The change in the width of the sleeve in divers and tips of group IV is jump-like. There are no tips transitioning from group I to group IV according to this feature. It is believed

that this phenomenon is not accidental. Let us recall that a characteristic feature of most Eastern European traditional plows was the presence of a double blade, the components of which formed a single unit with the handles. The plow was as if composed of two halves of the handle design. Obviously, such a tool had to have a working tip, the width of the sleeve of which was at least twice as wide as the width of the sleeve of the divers. The mentioned fact gives strong reasons in favor of the fact that the plow implements provided with symmetrical tips of group IV had the same structure of their base as most of the Eastern European "ethnographic" plows and plowshares, that this feature was characteristic of medieval plows, widespread as on the territory of Ukrainiana, as well as in Volga Bulgaria.

If this is so, then the structure of the body of such tools, which were originally equipped with symmetrical tips, appears to be asymmetrical at first: the shaft was fixed in them in one of the handles, more precisely, in one of the structures that performed the functions of the handle and parts of the double slide. An alternative to such fixing of the beam is only its position between the handles. Then such a tool will be symmetrical in its design and can be reconstructed as having a double symmetrical shelf or no shelf at all. But such a method of attaching the shaft to the tool, the basis of which was two parts that combined the functions of parts of a double slide and handles, is technically unlikely. It would require a complex system of fastening the shaft and handles, but even then it would not be reliable enough. There are no convincing ethnographic examples of such tools, which is hardly a coincidence. The analysis of iconographic data also shows that already in pre-Mongol times, when symmetrical tips of group IV prevailed, East Slavic plows had a double skid and an asymmetric body design with a shaft attached to one of the handles.

The comparison of these data, in our opinion, may indicate that both the symmetrical tips of group IV and the asymmetrical ones belonged to the same

new plow tool - a plow with a one-sided fixed shelf. The absence of specimens with left-sided asymmetry among the tips of group IV indicates that the shelves of Eastern European plows were right-sided from the very beginning. The transition from symmetrical plowshares to asymmetrical plowshares, which began at the end of the pre-Mongol period and ended mainly in the XIV-XV centuries, should be considered not as evidence of the appearance of a new plowing tool at this time, but as an indicator of the improvement of its plowshare, its adaptation to more efficient work with fixed shelf that appeared earlier.

As for the symmetrical tips of type IVB3, which appeared in Prykamia, probably not earlier than the 14th century, they differ little in size and proportions from similar tips of type IVB1 and 1VB4. The average width of the sleeve of such tips is 14-15.5 cm. It is important to note that the naralniks known in their area, some of which are similar to the tips of type IVB3, and the other part belongs to an earlier time, have a width of the sleeve up to 9-11 cm. Thus, there is no such sudden change in the width of the front end of the skid, which is established for plows and plows of Kyiv Rus and Volga Bulgaria. This fact can be regarded as an important indicator of the differences in the structure of Ukrainian and Bulgarian plows, on the one hand, and Prykamy plows, on the other. The latter probably had a single slide, and their formation can be imagined as a simple increase in the size of a certain type of ral. The already mentioned plows of the end of the XVIII-XIX centuries can serve as ethnographic parallels to medieval plows with such tips. north-eastern regions of European Ukrainiana (light one-plough plows, ploughshares), which had a single plow handle design.

If only group IV tips are counted among the working plow tips in the archaeological material, then the question of the time of the appearance of the plow in Eastern Europe will be solved quite simply and unambiguously. The

earliest tips of this group should be considered tips of types IVB1 and IVB2. The first were widespread in the ancient Ukrainian lands, the second - on the territory of Volga Bulgaria. Their appearance should determine the time of the appearance of the plow in Eastern Europe.

Early Old Ukrainian symmetrical ploughshares found on monuments widely dated to the 11th-early 13th centuries. Such are the hillforts of Kolodyazhyn, Divich-gora, Raikovetske, ancient Izyaslavl, etc. Some monuments can be attributed to the end of the X-beginning of the XIII century, for example, the settlement of Knyazha Gora, which is considered as the city of Roden, mentioned in the annals in 980 [V.Y. Dovzhenok, 1961, p. 74, 75]. A narrower dating of the time of appearance of these tips is not yet possible. Most of the pre-Mongol ploughshares belong to the layers of the end of the period under consideration. They have never been found at earlier monuments, dated between the VIII-X and IX-X centuries, although there are finds of tips of plowing tools of other types. Presumably, symmetrical ploughshares appear simultaneously in Volga Bulgaria, as evidenced by their findings in the layers of the Hulash hillfort in Tatarstan [Kakhovsky V.F., Smirnov A.Ya., 1972, p. 65, 71-73] and the town of Murom in the Kuibyshev region. [Matveeva G.I., 1974], broadly dated to the beginning of the 13th century. The majority of Bulgarian symmetrical ploughshares originate from random finds or complexes that do not have a narrow dating. The proposed date of the appearance of the plow in Eastern Europe is in full accordance with the data of the written sources, which were discussed above. Mapping finds of "archaeological" ploughshares makes it possible to outline the area of Eastern European medieval plows (Fig. 74). Most of the finds are concentrated in Ukrainian lands, mainly in forest-steppe areas and in the south of the forest zone. Many tips of group IV were found on the territory of Volga Bulgaria, also mainly in the forest-steppe. There are separate finds in the forest Prykamy.

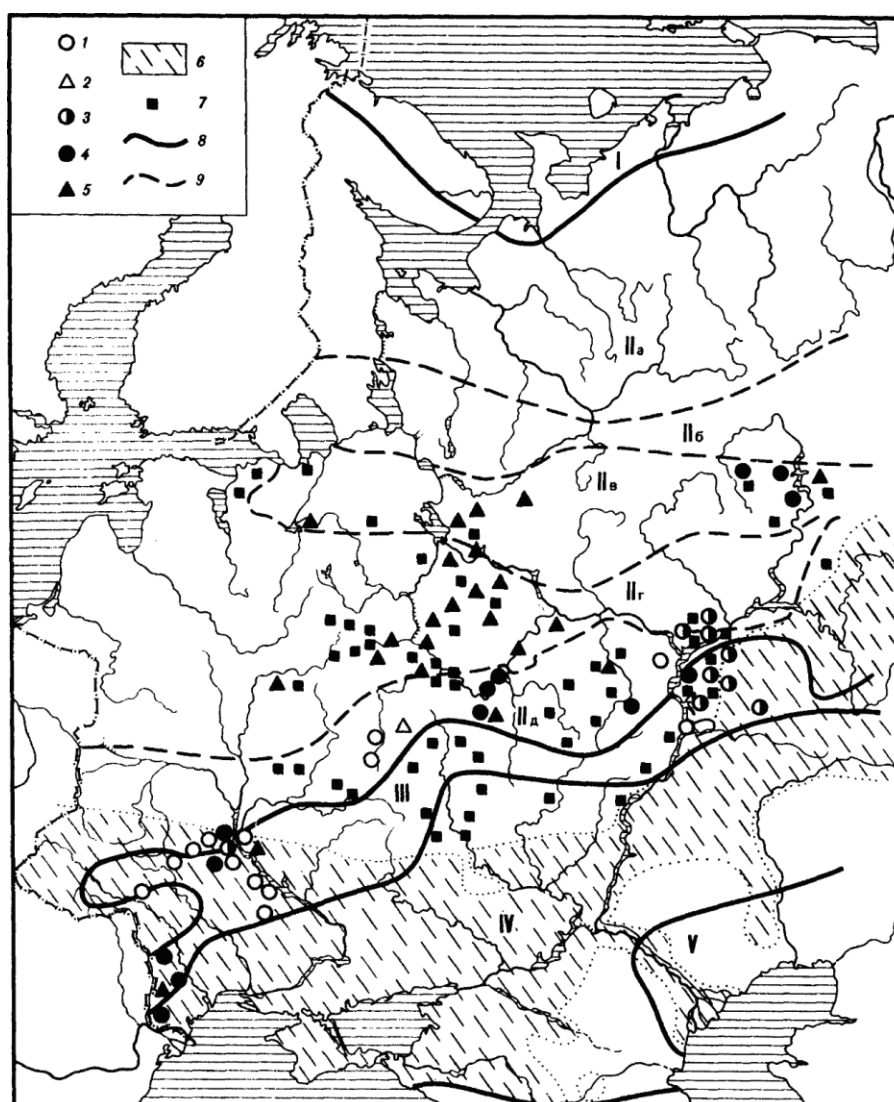


Fig. 74. Spread of plows in Eastern Europe:

1- according to finds of ploughshares of the 11th and early 13th centuries; 2- according to the written sources of the pre-Mongol period; 3-by finds of ploughshares broadly dated to the X-XIV centuries; 4 - according to finds of ploughshares of the second half of the XIII-XVI centuries; 5-according to written sources of the XV-XVII centuries; 6- the main range of plows until the middle of the 19th century; 7-regions of plow use outside their main area; 8- borders of landscape zones; 9- boundaries of subzones in the forest zone; I tundra; IIa - northern taiga; IIb-middle taiga; IIc southern taiga; IIg subzone of mixed forests; IId subzone of broad-leaved forests. III-forest-steppe, IV-steppe; V-semi-desert few tips of type IVB3 from Prykamy, which appeared later. Evidently, the mentioned series of tips differed in the manufacturing tradition, which may have been caused by certain differences in the details of the structure of the tools.

The concentration of such findings is clearly evident in the areas with chernozem, chernozemoid, and gray podzolized soils of deciduous forests (Figs. 63 and 74). Evidence from written sources does not contradict this picture, significantly supplementing it for the XIV-XVI centuries. regarding the forest zone.

If we leave aside the sign of symmetry or asymmetry of the blade, which has a chronological character, then among the tips of group IV, three large series can be distinguished, which differ in proportions, size, and some details of the form. The first includes tips of types IVB1, IVB4 and IVB6, distributed mainly in Ukrainian lands and Moldova, and the second - tips of types IVB2 and IVB5, most of which originate from Volga Bulgaria. Both series appear almost simultaneously. They belong to the third series

Most of the Old Ukrainian and Volga-Bulgarian tips of Group IV were found during regular excavations together with combs, which were apparently a common part of them. Combs were not found in Prykamia. It is likely that plows with IVB3 mud tips were used without them. In the XI - at the beginning of the XIII century. there is a significant increase in the maximum size of cheresels from archaeological finds on the ancient Ukrainian lands. Their minimum sizes remain practically unchanged (see Appendix 2). Apparently, this fact was reflected in the appearance of larger plowing tools - plows, the combs of which were on average larger than those used on plows.

Let's briefly dwell on the characteristics of Western and Central European plows of the Middle Ages from the point of view of their functional and structural features. This will make it possible to imagine what was common to all European plows, and what was special about them in different regions.

Medieval Western written sources [Agriculture. . ., 1936; Niederle L., 1956, p. 309-314; Podwinska Z., 1960, p. 123-158; 1962, p. 173-178, 194-203],

as well as Eastern Europeans, consider the plow as a tool that differs from the plow by greater complexity, larger dimensions and greater productivity, often by a greater number of animals harnessed to it (two or more pairs of bulls or horses instead of the standard one for double sled plow). Initially, plows were used only in large farms. The great productivity of the new tool was reflected, as in Kievan Rus, in the amount of taxation on farms that had plows. There are instructions on the use of a plow for raising virgin land, cultivating heavy soils, and preparing steam fields. Their details include the ploughshare, comb, wheel front. However, written sources do not contain data on the design features of such weapons. The rich Western European iconographic material fills this deficiency and makes it possible to distinguish several stable types based on the features of the arrangement of the plow body.

The first type (Fig. 75, 1, 2) includes plows with a single skid, which was one piece with the handle, which was usually bifurcated in the upper part, a straight shaft and a rack. The scheme of their design is similar to the design of single-handle straight-shaft plows with a rack. In most cases, plows of this type were depicted with a two-wheel front; in only one image of the 17th century. the plow is shown with a small wheel supporting the front end of the share. Single-sided shelves are shown on both the left and right. Images of plows of this type have been recorded since the end of the X-XI centuries. Such are the miniatures of English manuscripts of the end of the X-XI centuries. Julins BVI [Grupp G., 1923-1925, vol. 2, p. 41] and Tiberins BV [Steensberg A., 1937, p. 6; Payne FG, 1957, tab. IX], the Soissons manuscript around 1300 [Steensberg A., 1937, p. 268, 269], seal of the 15th century. of the Fros district in Denmark [A. Steensberg, 1937, p. 12], a painting of the 17th century. from the BUkrainianels Museum [Brandt R., 1927 - 1929, vol. II, fig. 244] and others.

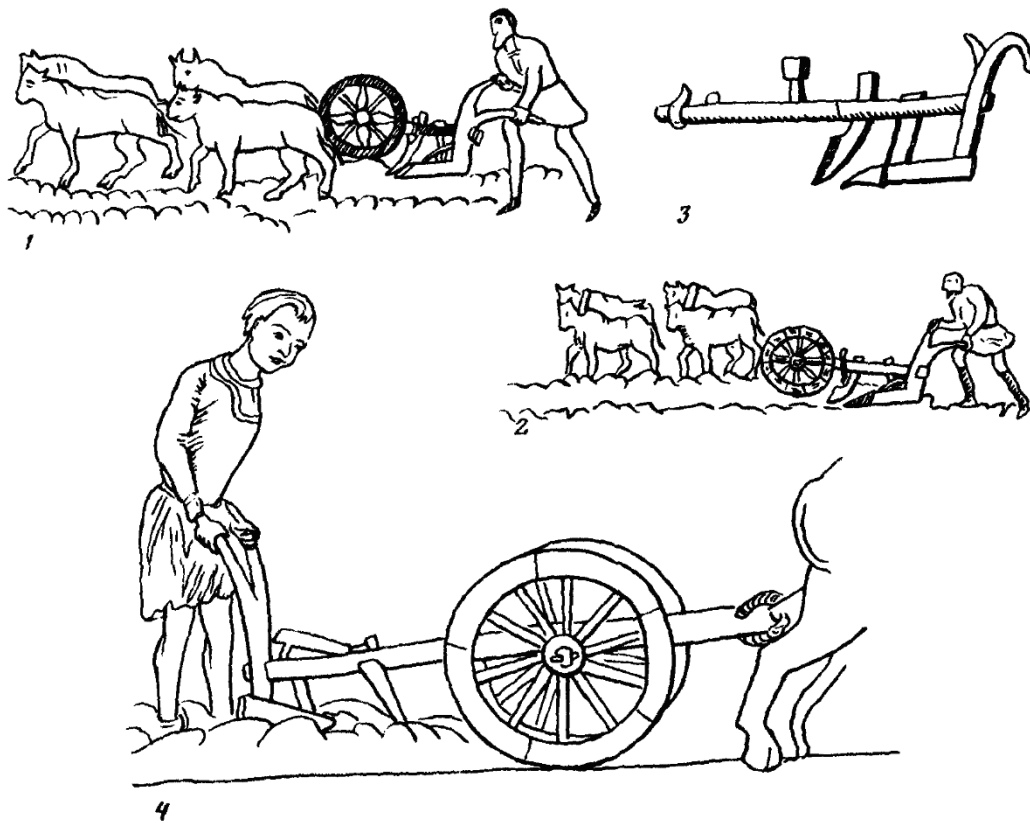


Fig. 75. Medieval plows of Western and Central Europe:

1- based on a miniature of the English manuscript of Tiberius I, V, end of X, beginning of XI century. (for G. Group); 2-according to the miniature of the English manuscript Julius A VI of the end of the X - beginning of the XI century, (according to G. Group); 3-according to the image on the coat of arms from Hungary in the 15th century. (according to M. Beleneshi); 4-based on a miniature from the German manuscript "Nortus deliciarur der Berred von liaiidshorg" around 1170 (according to A. Stinsberg)

On some miniatures, wheeled implements of this design are shown with double symmetrical shelves, which makes us consider them heavy plows (for example, one of the miniatures of the English Gaedemon manuscript circa 1000 [Steensberg A., 1937, fig. 7], on others – without shelf devices (one of the miniatures of the Gaedemon manuscript, an image from Denmark of the XV

century [Steensberg A., 1937, figs. 8, 17, 18], on others - without shelf devices (one of the miniatures of the Gaedemon manuscript, image from Denmark of the XV [Steensberg A., 1937, fig. 8, 17, 18], drawing from the English edition of Virgil's Georgics around 1475 [Salzrnan L. A. A', 1926, p. 42, etc.]. Part the latter can be considered plows, and the absence of shelves can be considered either a convention of the image or an indication that these plows had adjustable, removable shelves.

The second type includes wheeled tools, in which the slide and the handle, often bifurcated in the upper part, were formed by separate parts (Fig. 75, 3, 4). They also had a straight shaft and a rack. Their design is similar to the RAL design with a four-element body. Single-sided shelves are shown on both the left and right. Such are the images on the carpet from Vaia of the second half of the 11th century. [Philippi F., 1923, tab. 7], miniatures of the German manuscript Hortus deliciarum...about 1170 [Leser R., 1931, fig. 20)] to a Northern French manuscript of the 12th century. [Müller S., 1902, fig. 30), manuscripts of Swiss work around 1275 [Brandt R., 1927 - 1929, vol. II, fig. 19] etc. Some images cannot definitely be interpreted as plows, because they either lack plow devices, or the nature of the latter is unclear. These are, for example, miniatures of the Flemish manuscript "Breviarum Grimmavi" around 1475, the Flemish calendar around 1520 [Agriculture..., 1936, fig. 55, 60], image on the coat of arms of the 15th century. from Hungary [Belenyesy M., 1958, fig. 1].

The third type can be single-handled wheelless tools that had a shoe that supports the front end of the shaft. The slide and handle, sometimes bifurcated, are formed by independent parts, the shaft, unlike the first two types, is curved in the front part downwards, towards the shoe. We meet images of such plows, for example, on a miniature of a Northern French illustrated psalter of the end of the 13th century. [Haudricourt A G., Delamarre M. J.-B., 1955, fig. 144] and a schematic drawing from an English manuscript of 1281 [Calvin N. M., 1953, p.

No. 5-167, fig. 1].

XIII century date from the Basel calendar and the Augsburg psalter, on the miniatures of which there are the first images of wheel plows of the fourth type [N. Swarzenski, 1936, tab. 77, 456, 126, 690]. Such plows are especially often found on miniatures and engravings of the XV-XVII centuries. Examples can be a woodcut from the Dutch book "Wirkung der Planeten" around 1475 [Baiters A., 1900, fig. 6], an engraving of Boccaccio's book "Von beriihmten Frauen" published in Ulm in 1473 [Brandt P., 1927 - 1929, vol. II, fig. 96], German engraving of the end of the 15th century, engraving from the German book "Tentsehen Kalender" of the beginning of the 16th century. [Brandt P., 1927 - 1929, vol. II, fig. 16] and a number of others [Brandt P., 1927 - 1929, vol. II, fig. 9, 211; Baiters A., 1900, fig. 9, I, 30, 72; Leser R., 1931, fig. 32; Steensberg A., 1937, fig. 19; Podwinska Z., 1962, fig. 132, 133]. Their basis was a powerful straight bed, often in the form of a wide and thick board, to which a horizontal slide was connected from below with the help of two racks (see Fig. 70, 2, 4). In terms of structural details, such plows are quite diverse. They were depicted with a single-sided shelf, both left- and right-sided, sometimes of large sizes.

To the fifth type, we include wheeled tools with a wide horizontal slide, sometimes bifurcated at the rear end, formed by a separate part, two handles fixed at the rear end of the slide, and a shaft that was inserted into one of the handles, usually the left one (Fig. 76, 1; 77, 3). Their shaft is usually straight, rarely curved in the initial part. By their design, such tools are asymmetric and intended for installation of only one-sided fixed shelf. The latter was attached to the rack with one end, the other - to the handle, usually the right one, slightly moved to the side. Image of plows of this type with a straight shaft are known from the 14th century. [miniatures of the German Sachsenspiegel manuscript around 1330 or 1390 [Amiga K., 1902], image of the 14th century.



Fig. 76. Medieval plows of Western and Central Europe:

1- a detail of the painting of the church in Slavetyn (Czech Republic) of the 14th century. (according to F. Shah); 2-according to a miniature of a Swiss raota around 1275 (according to P. Brandt); 3-based on the illustration for the German book "Tentsehen Kalender" of the beginning of the 16th century. (according to P. Brandt); 4 - based on Steinwachel's miniature for Boccaccio's book "About Famous Wives", 1473 (according to D. Balters)



Fig. 77. Medieval plows of Western and Central Europe:

1- based on the miniature of the 14th century English Bible. (according to Z. Podvinska); 2 - according to a miniature of an English manuscript around 1380 (according to P. Leser); 3- based on the miniature of the German manuscript "Saclisetispiegel" around 1390 (according to Z. Podvinska); 4 - from an illustration in a Czech book around 1575 (according to F. Shah)

In the painting of the church in Slavetyna in the Czechoslovak SSR [Sack F., 1963a, fig. 37], an engraving from Johann von Hemund's calendar around

1475 [Diderich E., 1908, fig. 126], the image on the coat of arms of the second half of the 15th century. from Hungary [Belenyesy M., 1958, fig. 3], a miniature of a German manuscript of the 15th century. from the Rhine region and of this type with a straight shaft are known from the 14th century. [miniatures of the German *Sachsenspiegel* manuscript around 1330 or 1390 [Amiga K., 1902], image of the 14th century. in the painting of the church in Slavetyna in the Czechoslovak SSR [Sack F., 1963a, fig. 37], an engraving from Johann von Hemund's calendar around 1475 [Diderich E., 1908, fig. 126], the image on the coat of arms of the second half of the 15th century. from Hungary [Belenyesy M., 1958, fig. 3], a miniature of a German manuscript of the 15th century. from the Rhine region and German engraving on copper of the 16th century. [Brandt R., 1927 - 1929, vol. II, fig. 111, 123], engraving of the Polish calendar of the XVI-XVII centuries. [Podwinska Z., 1962, fig. 137, etc.], with a curved one - from the end of the XIV-XV centuries. (for example, drawings from French manuscripts of the XV-XVI centuries [Marle R., 1931, fig. 395; etc.], the Czech codex of Jan Einstein 1396-1397 [Friedl A., 1931]. A special variety of this type was wheelless two-handled plows, distinguished by the fact that their shaft was bent downwards at the front end (Fig. 77, 1, 2). These are plowing tools depicted on miniatures of English Bibles of the 14th century [Haudricourt AG, Delamarre M. J. -B., 1955, Fig. 145; Podwinska Z., 1962, Fig. 131] and the so-called "Langland Manuscript" of the same time [Leser R., 1931, Fig. 42].

The sixth type includes the image of a plow from a Czech book published around 1575 [Sach F., 1963, fig. 18]. The basis of this plow (Fig. 77, 4) consisted of two solid parts that served as handles and parts of a double blade, on the front end of which a massive asymmetric plowshare was attached. The shaft is straight, the rear end is inserted into the right handle. The shelf is not shown in the picture, but the asymmetric design of the case and the asymmetric blade leave no doubt that it was fixed, one-sided. This plow stands alone in its

construction among other plows of Central and Western Europe and, in fact, does not differ from the same tools that have been characteristic of Eastern Europe since pre-Mongol times.

The given review makes it possible to assert that by the XIII century. Western and Central European plows had a symmetrical body structure that allowed the installation of both bilaterally symmetrical and unilateral shelves, fixed or adjustable. The basic scheme of the design clearly shows the genetic connection of these plows with different types of plows. Only from the XIV century. fine art records here the appearance of plows with an asymmetric body, the very structure of the base of which requires the installation of a one-sided fixed shelf. But even much later, plows with a one-sided shelf, but with a symmetrical body structure, continue to be found in numerous images.

In all images of plows up to the XIII century. inclusive, on which the shelf is shown, it has the form of a narrow straight board (Fig. 75, 1, 4, 76, 2). In most cases, such shelves, on the right and left, as in the ral, could be movable and removable. Perhaps that is why many wheeled plowing tools were depicted without shelves on miniatures. Large, of course, fixed one-sided shelves, usually straight in longitudinal section, appear on medieval images only from the 14th century, and at first only on tools with an asymmetric design (Fig. 77, 2-3). Already in the XIV-XV centuries. probably, attempts were made to manufacture curvilinear shelves, which contributed to a more complete turnover of the skiba. This is the way to interpret, for example, the image of plow shelves on some miniatures of the *Sachsenspiegel* manuscript and a northern French miniature around 1480 [Haudricourt AG, Delamarre M. J.-B., 1955, p. 365, fig. 147].

Even taking into account the convention of depicting a number of plow details on medieval miniatures, it is possible to state with a high degree of probability that up to the XIII century. plows were depicted with symmetrical blades. Only from the XIV century. and again, plows with an asymmetric

structure of the body can be seen in their images with clearly asymmetric plowshares [see, for example: Amira K., 1902, fig. 29, 41, 53; Bach F., 1963a, fig. 37; Belenyesy M., 1958, fig. 3]. On many other images of plows of the XIV-XVI centuries. the shape of the plow continues to remain symmetrical, although the plows had a clearly visible one-sided shelf [see, for example: Baiters A., 1900, fig. 9; Brandt R., 1927 - 1929, vol. II, fig. 16]. Evidence of medieval miniatures about the time of the appearance of asymmetric plowshares in plows is in good agreement with archaeological data: the earliest, precisely dated asymmetric tips, which should be associated with plows, in the territory of Western and Central Europe belong to the end of the XIII-XIV centuries. Such, for example, are plowshares from Semonic in the Czech Republic, Zemendorf and Ilrinzdorf in Austria [Podwinska Z., 1962, p. 190-192, fig. 102, 105].

Thus, the plows of Western and Central Europe of the X-XIII centuries. in terms of their structure, they were still very close to RAL. With a high degree of probability, they can be reconstructed as having removable, adjustable shelves, although, of course, the possibility of the existence of plows with fixed shelves cannot be denied. The most important step in their improvement, expressed in the provision of the plow with an asymmetric design and the beginning of the use of asymmetric tips, belongs to the end of the XIII-XIV centuries. Almost all types of medieval plows of Medieval Western and Central Europe known from iconographic data find analogies in the ethnographic material of the same territories.

New plowing tools that appeared among the Ukrainian and Volga Bulgarians no later than the 11th and 12th centuries and known in written sources as plows and sabans, were larger and more productive tools than plows and ploughshares. All plows were equipped with massive and relatively large plowshares, initially symmetrical, and from the end of the XIII-XIV centuries. - with pronounced asymmetry of the blade, almost always with combs.

The most important feature of the structure of the early East Slavic and Volga-Bulgarian plows was probably the presence of a double blade, the parts of which formed one whole with the handles, which from the very beginning were two. The presence of a double blade in Eastern European plows from the time of their formation can be evidenced by the diameter of the hub of the plowshares, which is twice or more than the diameter of the hub of the plowshares, as well as the image of the plow in the miniature of the Radziwill Chronicle, for later periods - the image of plows in the painting of the Voronetsky Monastery and on the engraving from "Teacher's Gospel" of the Kyiv-Pechersk Lavra. The last two images give a clear idea that the skid parts of such plows were one piece with the handles. These design features have been preserved almost unchanged in most traditional Eastern European plows of the XVIII-XIX centuries. It can be assumed that the most ancient plows of the Eastern Slavs and Volga Bulgarians were formed according to the principle of "doubling" of the plow - the combination of two plows of the handle design in one tool with one iron working tip. The specified structural features sharply distinguish even the earliest Eastern European plows from the same Western and Central European ones.

From the time of their formation, the plows of the Eastern Slavs and Volga Bulgarians had a one-sided fixed shelf and were intended for one-sided plowing with the rotation of the scythe: the two-handledness of the Eastern European plows, as well as the fact that the handle in them was one whole with the parts of the double blade, forced to reconstruct harrow inserted into one of the handles, as in most "ethnographic" plows of the considered territory. This presupposes the asymmetry of the tool itself, the installation of only one-sided fixed shelf on it, which is already evidenced by the miniature of the Radziwill Chronicle.

Medieval Eastern European plows had only the right side shelf. In the

archaeological material of this territory, in contrast to Central and Western Europe, there are no known finds of ploughshares with a left-sided asymmetry of the blade.

Did medieval Eastern European plows have a curved shaft?

There are no objective data on the curvature of the girder in the horizontal plane in the sources, so the question remains open. Apparently, this form of the harrow appeared only when the ploughshare acquired a pronounced asymmetric shape. As for the curvature of the shaft in the vertical plane, the available data indicate that such a feature was not characteristic of early Eastern European plows: on the images of plows of the XVI-XVII centuries. the shaft is shown straight. The same assumption can be made regarding the plow of the Radziwill Chronicle. It is possible that the curvature of the shaft in the vertical plane, characteristic of most (but not all) "ethnographic plows" of the analyzed territory, is a relatively late phenomenon, not related to tradition, not to the origin of the plow, as some researchers assume [Chernetsov A .V., 1972, p. 399-402], and on the one hand, with the desire to place the attachment point of the screed with the base of the tool as low as possible, on the other - to eliminate the clogging of the space between the comb, skid and screed with rising sod. The last circumstance was especially important during plowing of lands with thick grass cover. It is no coincidence that the degree of such curvature was very different even in traditional Ukrainian plows, while in Ukrainian harrows it was almost straight.

Some of the medieval plows of Eastern Europe had a wheel body, as evidenced by their depictions in the Radziwill Chronicle, the "Teacher's Gospel", on the icon of the 17th century. from Kyivan Rus, as well as written sources of the XVI-XVII centuries. Along with wheeled plows, wheelless plows were also used, an example of which is the image of a plow in the painting of the Voronetsky Monastery.

Having the same structure of the base, the plows of the Eastern Slavs and the Volga Bulgarians differed, probably in some features that are not clear enough for us, which were reflected in the proportions and sizes of their plowshares. Volga-Bulgarian ploughshares and combs were on average larger than East Slavic ones, which may indicate the somewhat larger size of Volga-Bulgarian plows. However, such differences are clearly visible only for pre-Mongol times. Shovels of the XIV-XVI centuries, while preserving the differences in proportions, they become practically the same in size in both Kyivan Rus and Volga Bulgaria. Later, the differences in proportions are evened out.

In plows with tips of type IVB3, which appeared no earlier than the 14th century, in the Middle and Upper Kamia, the slide consisted, most likely, not of two, but of one part. Presumably, these plows were also formed on the basis of the ral of the handle design, but not by "doubling" them, like the East Slavic and Volga-Bulgarian ones, but by adapting the large-sized one-sided shelf to the ral without significant changes in the design of the tool.

Medieval Eastern European plows were smaller in size than many plows of the 18th and 19th centuries, and were often used in pairs, like plowshares. Significant differences are observed in the sizes of plowshares and combs of "archaeological" and "ethnographic" plows (Figs. 78-80). Thus, the maximum and minimum total length of the series of plowshares from ethnographic materials is almost twice the same indicators for plowshares of the pre-Mongol period. The upper limits of the change in the largest width of the blade for the same "ethnographic series" exceed the same dimensions for the series of ploughshares of the pre-Mongolian era by more than two times, the minimum - slightly less than one and a half times. Differences between the upper and lower limits of the change in the average width of the sleeve of pre-Mongol ploughshares in the XVIII-XIX centuries, somewhat smaller: the upper limits

increase by approximately 80%, the lower limits by 25%. Even smaller differences are observed in the length of the combs.

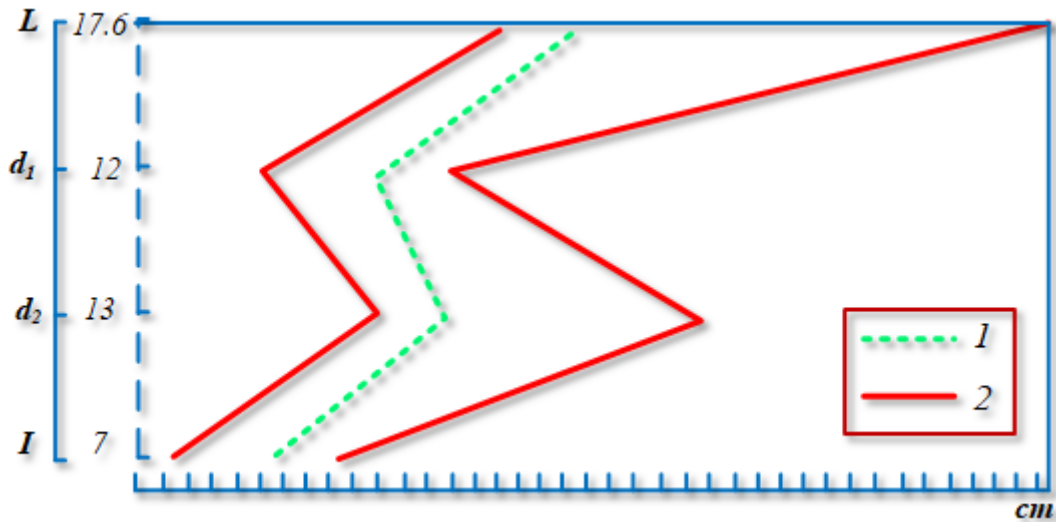


Fig. 78. The ratio of the main parameters of the tips of plowing tools:

1- archaeological" plowshares of types IVB1, IVB4, IVB6; 2 - plowshares and plowshares from ethnographic materials of Eastern Europe

However, the importance of this circumstance should not be exaggerated. Over time, the size of plowshares grew faster than the size of the tools themselves. In the traditional plows of the peoples of Eastern Europe, the length of the blade was more than half of the total length of the blade. Therefore, on their sleeve, and sometimes on the back of the blade, there is usually a hole for a rack [see, for example: V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi, 1971, tab. VIII]. Plows from archaeological materials never have such a hole. This indicates their shorter length relative to the bare skid.

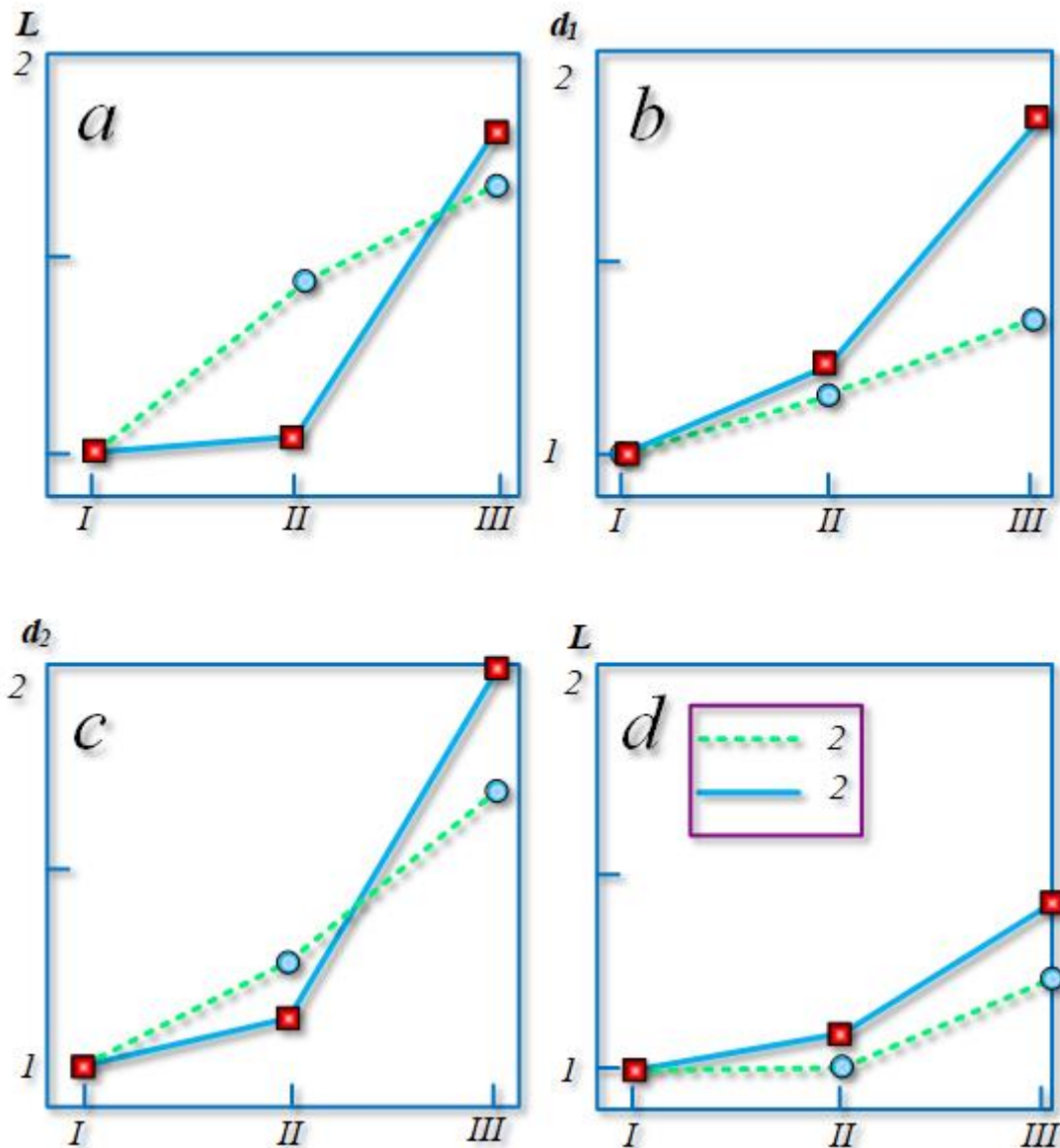


Fig. 79. Changes in the size of the iron parts of Eastern European plows over time (the unit is taken to be the dimensions characteristic of the XI-beginning of the XIII century):

and- total length of plowshares; *b* - the average width of the sleeve of the plowshares; *in*- the largest width of the plow blade; *g* - length of combs;

I- XI - beginning of the XIII century; *II*- the second half of the 12th - 16th centuries; *III*- XVIII - beginning of XX century.

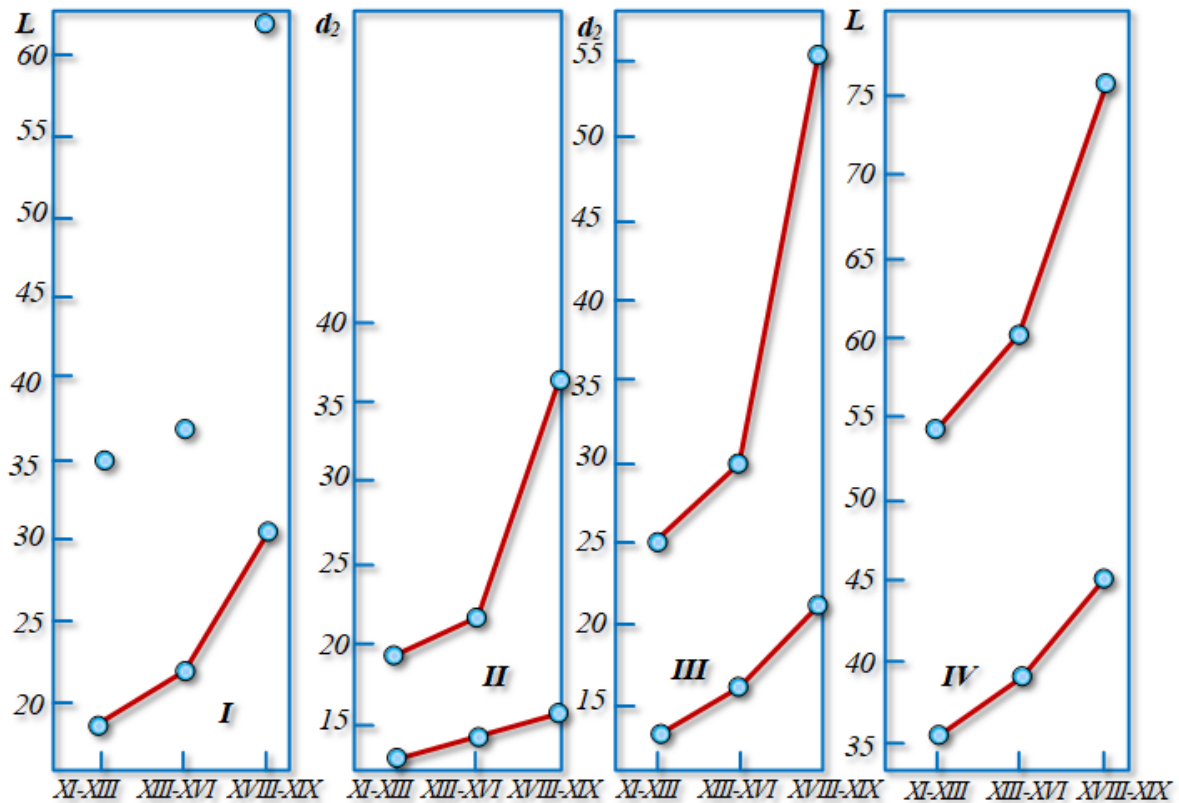


Fig. 80. Chronological changes in the minimum and maximum sizes of iron parts of Eastern European plows:

I- total length of plowshares;

II- the average width of the sleeve of the plowshares;

III- the largest width of the plow blade;

IV- the length of the brushes

The most realistic images of plows in Western European medieval iconography can be composed idea that the ratio of the total length of the skid to the length of the tip in them was much smaller than in ethnographic plows, and was 2.4-3. In the image of the plow in the painting of the Voronetsky Monastery, the ploughshare is also about a third of the total length of the plow.

It is probably no coincidence that the biggest differences between "archaeological" and "ethnographic" plowshares are observed precisely in the overall length and greatest width of the blade. Evaluating the differences in the width of the sleeve of the same plowshares, it is necessary to recall that ethnography has documented cases when, if necessary, an additional bar was laid between its component parts, which had more or less standard dimensions, to make the skid wider.

Apparently, the differences in the length of plowshares cannot directly indicate significant differences in the sizes of the main parts of medieval plows and traditional ones of the XVIII-XIX centuries. Most of the traditional plows whose blades we measured had a shaft curved in the vertical plane. As for medieval plows, the data available at our disposal allows us to consider them straight-shafted. But in crooked tools, as already mentioned, the length of the pommel is relatively longer than in straight tools of the same size.

Thus, it is not possible to mechanically transfer differences in the sizes of iron plow tips from archaeological and ethnographic materials to the sizes of plowing tools themselves.

Apparently, even the plows of the pre-Mongolian era can be compared in terms of their size with the small plows of the 19th century, an example of which can be the well-described plow from the village of Old village near Kyiv [Mamonov V.C., 1952]. However, due to the smaller size of the plowshare, and most importantly - the imperfection of its shape, which does not allow transferring the entire cut layer to the shelf, the working qualities of medieval plows were obviously much lower than those of "ethnographic ones", even for the same size as them.

The available data most likely confirm the thesis about the local, Eastern European origin of the plows of the Eastern Slavs and Volga Bulgarians: the

structural differences between them and similar plows of Western and Central Europe are too great to raise the issue of borrowing a ready-made, shaped tool from the West. Western European plows of the X-XI centuries. were single-handled (sometimes the handle split from above), with a single slide. This last and the handle were often made from separate parts. The design of such tools made it possible to use both fixed shelves and adjustable shelves, as well as two-sided, symmetrical shelf devices. The two-handled construction of plows with a shaft inserted into one of the handles, but with a single skid formed by a separate part, adapted for asymmetric plowing with the use of a fixed shelf, appeared in the West at the end of the 13th - at the beginning of the 14th century.

At the same time, the plows of the Eastern Slavs and Volga Bulgarians, as we tried to prove, from the very beginning had a double skid and were two-handled, with an asymmetric design of the body, which necessitated the use of a one-sided fixed shelf. They were formed, apparently, as a result of combining two plows in one tool, a kind of "doubling" of them, that is, according to a different principle than Western European plows. These differences persisted until recently, testifying to different cultural and historical traditions in the manufacture of plows in different regions.

We should also note that the plowshares of Eastern European plows, despite their general similarity in shape, differ in some dimensions from the large symmetrical tips from the archaeological materials of Western and Central Europe, which can be associated with plows (Fig. 81). In the series of the latter, there is no sudden change in the differences in the width of the sleeve compared to the undisputed divers. This can be considered as an indicator not only of different traditions in the manufacture of the tips themselves, but also of significant differences in the structure of the plow blade. The same differences persist with regard to asymmetric plowshares.

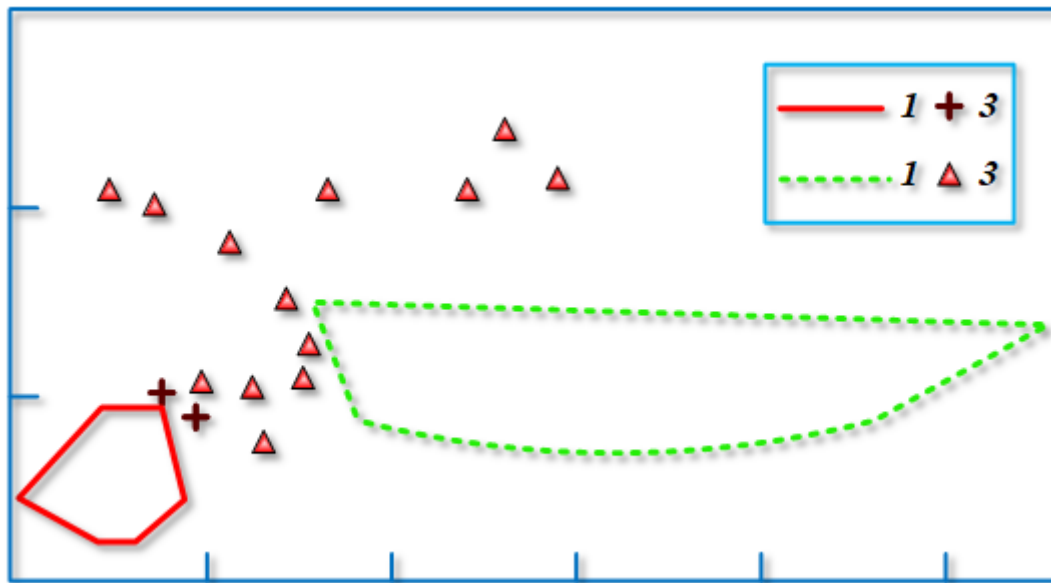


Fig. 81. Symmetrical plowshares from the archaeological material of Eastern and Central Europe (correlation of the ratio of the total length to the average width of the hub and the total length to the length J of the hub)

- 1- plowshares of type IVB1;
- 2- IVB2 type ploughshares;
- 3- IVB3 type ploughshares;
- 4- plowshares from Central Europe

As we tried to show above, the etymology of the word "plough" cannot now be unambiguously interpreted and serve as a strong argument in favor of the fact that this tool came to Eastern Europe from the west. The same should be said about the origin of the name of one of the important parts of the plow - the share, which is often associated with Germanic languages [Zelenin D., 1907, p. 116, 120]. The term "gravel" was by no means universally used in Eastern Europe. In Ukraine, for example, there were terms equivalent to it "arrow", "shaft", "pridolyb" [V.F. Horlenko, I.D. Boyko, O.S. Kunytskyi, 1971, p. 46],

"drawbar" [Zelenin D., 1907, p. 84], in Ukrainiania - "drawbar", in the Middle Volga region among Ukrainians - "arrow" [Zelenin D., 1907, p. 89]. In the Turkic languages, the gryadil was called "sabanny bow" [Zelenin D., 1907, p. 89; N.A. Khalikov, 1981, p. 57]. All other terminology related to the plow appears to be completely local in the Slavic and Turkic languages of the peoples of Eastern Europe [see about it: D. Zelenin, 1907; V.F. Horlenko, I.D. Boyko, O.S. Kunitseky, 1971; Naidych D.V., 1967; N.A. Khalikov, 1981]. Thus, the linguistic data do not provide sufficient grounds for the opinion that the peoples of Eastern Europe borrowed the plow from the west.

A.V. Chernetsov, arguing against the assumption of the local origin of Eastern European plowing implements equipped with symmetrical plowshares (he called them heavy wheel plows, we consider them plows), pointed to the absence of transitional forms between such plowshares and the earlier broad-bladed plowshares [Chernetsov A.V. , 1972, p. 142, 147]. In view of the hypothesis proposed above about the formation of Eastern European plows by "doubling" of plows, such transitional forms as in Western and Central Europe should not be: differences in the width of plow plows, on the basis of which Eastern European plows could be formed, and the plows themselves were jumping. In addition, we have already paid attention to the possibility of establishing a genetic connection between the tips of type IV2, i.e. the most widespread in the East Slavic lands of naralniks, and IVB1, i.e. the earliest symmetrical plowshares in the same territory. The same genetic connection can be traced between the IVB3 mud plows, known from the Saltiv type monuments, and the Bulgarian symmetrical plowshares of the IVB2 type. This and a number of other circumstances mentioned above allow us to assume that plows with a skid, equipped with the named types of broad-bladed plowshares, served as the basis on which the first medieval plows of the Eastern Slavs and Volga Bulgarians were formed. These were single-handle straight-shaft plows

with a slide and a rack. Even before the appearance of the plow, they were often used with combs and, possibly, with a wheel front.

Another argument against the local, Eastern European origin of the plows of the Eastern Slavs and Volga Bulgarians is A.V. Chernetsov believes that traditional Ukrainian plows and plowshares have a curved shaft, which, in his opinion, could not have developed from a straight shaft, which was in the plows that preceded the plow. Since, according to A.V. Chernetsov, curved plows were widespread in the Mediterranean, in particular in the Balkans, where there are also close analogies to Eastern European plows, plowing tools with symmetrical plowshares in Ukrainiana and, apparently, in other areas of Eastern Europe were borrowed from the Balkans [Chernetsov A .V., 19726, p. 399-402, tab. 1; 1972].

It is difficult to agree with such an argument. The curved blade of Ukrainian plows and plowshares cannot be compared with the same detail of the curved blade of track and harrow plows. In the latter, the curvature of the girder was only in the vertical plane, in the others - both vertically and horizontally. Eastern European plows, on the one hand, and curved plows of the row and skid families, on the other hand, have a completely different structure of the base. In the latter, the shaft was connected to a horizontal single slide, which either formed a single unit with the shaft, or was formed by an independent part. In Eastern European plows, the handles and the double skid were a single unit. According to this feature, they should be genetically related only to hand-held rales. Finally, the data available at our disposal do not give reason to believe that the medieval plows of Eastern Europe had a shaft bent in the vertical plane. Observations on the structure of their parts, as well as the vernacular names of many parts of these tools, confirm the thesis about the genetic connection of Ukrainian plows and plowshares (handle construction). V.S. Mamonov rightly points out in this regard that the design features of the Ukrainian plow arose "at

some very distant stage of development as a natural phenomenon, when a new form of tool (i.e., a plow) was based on a well-known design form (i.e., a harrow) [Mamonov V.S., 1952, p. 43].

As for the time of the appearance in the north of the Balkans of crooked plows with a double skid, close to the Eastern European ones, we do not have any real data on this matter. It is possible that they appeared here relatively late as a result of any cultural impulses from the east. The same should be said about the only image of a plow from a Czech book of the 16th century for Central Europe, the structure of the body of which is similar to the Eastern European one. We will remind that until recently, plows of this design were used in the regions of Central Europe adjacent to the territory of our country, which is quite understandable and understandable for the border regions of large cultural and historical regions, as well as the use of western-type plows on the western outskirts of the territory under consideration.

Thus, we assume that the plows of the Eastern Slavs and Volga Bulgarians originated on the spot, in Eastern Europe, the first - in the forest-steppe areas of the Middle Dnieper region, where there is the greatest concentration of finds of their tips from the pre-Mongol period, the second - in the forest-steppe areas of the Middle Volga region . The structural features of similar types of plows, which were the basis for the formation of plows, as well as the same principle of their formation by "doubling" of the plow, led to the fundamental similarity of the design of the Old Ukrainian and Volga-Bulgarian plows, although there were probably some differences in details between them.

Obviously, plows equipped with plowshares of type IVB3 developed relatively independently, although much later, in Prykamia. They originated, probably, on the basis of hand-held rifles, which were supplied by type IV4 rifles. The expected features of the design of such plows show that they could be formed by simply increasing the size of the plows and adapting to them a one-

sided shelf, already known in the neighboring territories.

Speaking about the local origin of Eastern European plows, even about the independence of their emergence in certain areas of Eastern Europe, we mean only the independence of the technical embodiment of the principle of a large and heavy plow tool that works asymmetrically and is intended for plowing with the rotation of the scythe. This does not remove the question of borrowing the very idea of such a tool from outside. But for its solution in such a setting, in fact, we do not have specific data.

The essence of plowing with a plow is that a piece of soil is cut off in a vertical plane with a comb, cut horizontally with a plowshare, lifted, pushed aside and completely or mostly turned over with the help of a one-sided shelf. Plow plowing gave a qualitatively new agrotechnical effect. To a greater extent than plowing with a plow, it contributed to the rise of moisture from the lower layers of the soil to the upper ones, as well as aeration of the soil. Regular rotation and aeration of the soil layer contributed to the development of aerobic soil bacteria at the expense of anaerobic ones, which accelerated the mineralization of organic substances in the soil, that is, the process of humus formation. And this, in turn, affected the yield. It should be noted the ability of the plow to effectively destroy permanent grass cover, as well as weed roots by rotating the blade. The latter was also of great importance when plowing manure. All this was especially important during the steam farming system that prevailed almost throughout the Middle Ages.

The plow was not only a fundamentally new tool in terms of its agrotechnical impact on the soil, but also a larger, heavier tool than the plough. Plow plowing was deeper, plow furrows - wider. Thus, it was a more productive tool.

Its appearance made it possible to cultivate new lands on a large scale,

primarily heavy and occupied by powerful grassy vegetation, inaccessible or hardly accessible for plowing.

Taking into account the mentioned qualities of the plow and plow plowing, it is necessary, obviously, to approach the question of the reasons for the spread of this new plowing tool. Presumably, the historical conditions that caused the transition in tillage techniques from the ploughshare to the plow were as follows.

Population growth in the areas of the most developed agricultural economy at a certain time, different for individual areas of the European "plow zone", was supposed to lead to the exhaustion of lands suitable for cultivation under the conditions of the dominance of old agricultural techniques. This forced farmers, firstly, to look for ways to increase the intensity of exploitation of already developed fields, and secondly, to expand arable land at the expense of new lands, inaccessible or hardly accessible for cultivation with old plowing tools. The result of this was the almost universal spread in Europe of a new system of agriculture - steam farming, associated with fertilizing fields and restoring lost soil fertility through intensive steam cultivation¹⁰, as well as the expansion of arable land at the expense of land that was not constantly cultivated before. The plow could no longer fully ensure the effective cultivation of fields in the conditions of the steam system, especially the threshing floor, as well as the development of new lands with heavy soil. A new plowing tool was needed, more perfect in agrotechnical terms, heavier and more productive. Such a tool became the plow, equally adapted for effective plowing of long-cultivated lands, and for raising virgin lands, iron and fallow lands.

It is probably not by chance that the first plows in Eastern Europe appeared precisely in the forest-steppe areas of Kievan Rus and in Volga Bulgaria. These districts in the XI-XIII centuries. were quite densely populated; both there and here, arable farming had long-standing traditions, especially deep

in the forest-steppe Dnieper region. Presumably, this led to relative land "crowding", intensified by the process of feudalization of society. The expansion of the arable land fund in both areas could occur primarily due to lands with relatively difficult to cultivate forest-steppe and steppe types of soil, which had a thick humus layer and developed herbaceous vegetation, which were difficult to raise even with an improved plough. The intensification of agricultural production in both areas was stimulated initially by the development of feudal relations and the growth of trade and the completion of the process of separating crafts from agriculture. At the same time, successes in the development of the craft made it possible to spread such relatively complex tools as plows.

It is necessary to emphasize the connection between the emergence of the plow not only, and for some regions, not so much with the development of new difficult lands, but also with the spread of the steam farming system. It is with the last circumstance that the penetration of the plow into the forest regions of Eastern Europe, which is well recorded in written sources of the XV-XVI centuries, should be connected. The differences in the sizes of plowshares in pre-Mongol times in Kievan Rus and in Volga Bulgaria, which have already been noted, could probably be due to the fact that the ancient Ukrainian plows were primarily intended for work in the conditions of the steam farming system, the Volga-Bulgarian plows - for work on fields and fallows. Such differences in the dominant farming systems are indicated, in particular, by the analysis of paleobotanical material from Volga Bulgaria [see e.g.: Kiryanov A.V. 1955; Tuganaev V.V., 1976].

The main features of the design of Eastern European plows were formed already after the appearance of this tool no later than the XI-XII centuries. and were traditionally preserved until recently. Their development over time proceeded, first of all, by improving the most important working part - the ploughshare, searching for such a form of it that would correspond as fully as

possible to work with a one-sided fixed shelf, ensuring the fullest possible turnover of the plow. Secondly, the size of the iron parts of the tool increased, first of all, again, the plowshare, and to a certain extent - the plow itself. At the same time, the difference between the minimum and maximum sizes of both plowshares and plowshares, as well as the tools themselves, increased, which, presumably, should be connected with the different working conditions for which specific plows were created. It is possible to assume, thirdly, certain improvements in the design of the shelves, the frame of the plows, and their wheel fronts. However, the precise indication of such improvements is beyond the scope of the sources provided to us. It can only be noted that in the period from the time of the emergence of Eastern European plows to the middle of the 18th century. many of them acquired the shape of the shaft that became characteristic of traditional Ukrainian plows and plowshares, i.e. curved in the vertical and horizontal planes. The dimensions of the shelves, which, however, kept the appearance of a straight board, also increased significantly.

¹Tips of plowing tools at the turn of the first half of the 1st millennium AD. e. from archaeological materials of Central and Western Europe are symmetrical [Y.A. Krasnov, 1971, p. 3-9].

²We will remind that A.V. Artsykhovsky, who tried to reconstruct the appearance of the "Roman plow" on the basis of various sources, imagined it as a wheeled tool with a comb and "powerful double shelf boards" [A.V. Artsykhovsky, 1927, p. 130], that is, as a heavy wheel plow.

³"Plow" - Ukrainian, Bulgarian; "ping" - Serbian, "Polish", Croatian; "pluh" - Czech. and Slovak; "Pflug" is a cock. - German.; "plog" - Norwegian; "plow" - Swedish; "plov" - Danish; "ploeg" - Flemish; "plow" - English etc. The names of the plow in Hungarian, Romanian, and Albanian languages, as well as the

Turkish "pulluk" are probably borrowed from Slavic languages [Sergeevsky M.V., 1959, p. 60].

⁴If we accept that the word "plough" is Slavic in origin and is related to the word "sled" [Machek V., 1951, p. 206-217], it is quite likely that plows with a skid could be called plows at first, perhaps improved - with a comb and two-sided shelf devices.

⁵See, for example: "gryadil" - Ukrainian, Belarusian; "gronzil", "hriadel" - Polish; "hriedel" - Czech; "hradel", "gerendeb" - Slovak; "skid", "heel", "sole", - Ukrainian, Ukrainian; "palaz" - Belarusian; "ploz", "phiz", "podeszwa", "pieta" - Polish; "plaz", "patka" - Czech; "plaz", "poloz", "patka" - Slovak, "plaz", "plažitsa" - Bulgarian; "plazac", "plaz" - Serbian; "plaz" - Croatian. etc.

⁶Miniatures of English manuscripts of the late 10th - early 11th centuries. Julius AVI [Grupp G., 1923 - 1925, vol. 2, p. 41] and Tiberins BV [Payne FG, 1957, tab. IX].

⁷D.V. Naidych reports that in the 19th century there were well-known sabanas equipped with two shelves fixed on both sides of the ploughshare [Naidych-Moskalenko D.V., 1959, p. 45; Naidych D.V., 1967, p. 54]. However, she does not provide the sources from which this information was borrowed, as well as a detailed description of such tools. Perhaps she meant two-bladed plows [Statistical materials of the Vyatka province, 1888, p. 47; Naidych D.V., 1967, fig. 11A]. In our opinion, such tools were a kind of "hybrid", combining the features of a saban, from which the general scheme of the body structure was borrowed, and a two-toothed plow with practically horizontally placed teeth and feather coulter. The last circumstance allegedly testifies in favor of their rather late origin.

⁸The hereditary development of the shape of ancient Ukrainian ploughshares from archaeological materials and "ethnographic" plows based on the features

of the shape is well traced by O.V. Chernetsov [A. V. Chernetsov, 1972, fig. 4: 1976, fig. 1].

9 Earlier dating of a large asymmetric ploughshare from Vesel on Moravia in the Czech Republic [Sack F., 19636, fig. 5, 2] needs careful verification.

10 It has already been noted that the steam system of agriculture in the form of a two-pillar was known in some places in ancient times. Western European written sources testify to its existence outside the Roman Empire at the beginning of the 7th century. The first mentions of the triply system for the same districts date from the VIII century, and for the IX-X centuries. become numerous. However, dvopillia along with tripilliam is noted here even in the 13th century. and later [Agriculture. ..., 1936, p. 9, 11, 13, 47, 49, 192]. For Eastern Europe, except for the Northern Black Sea, the nature of the sources does not make it possible to accurately determine the time of the transition to the steam system. Research by A.D. Gorsky [Gorsky A.D., 1959, 1960] and G.E. Kochyna [Kochyn G.E., 1965, p. 231-248, 431] convincingly proved that by the end of the 15th century. in North-Eastern and North-Western Ukrainiana, the final victory of the steam system in the form of tripilla with the systematic application of manure and manure fertilizer is taking place. A little later it happened in the Baltic States [VV Doroshenko, 1959; Ligi N., 1963, p. 82-89; Yurgynys Yu.M., 1966], and also, presumably, in the Middle Volga region. But if by the end of the 15th century tripillia, i.e., a fairly developed form of the steam system, finally won even in the forest zone, then the beginning of its origin should be assumed at a much earlier time. We have already noted that the presence of separate elements of the steam system in the forest-steppe cannot be denied even for the middle of the 1st millennium BC. e., and even more so for the 1st millennium AD. e. In this regard, the assumption of V.Y. seems to be quite probable. Dovzhenok about the very large, presumably leading, role of the steam system in the form of a two-pillar

and, possibly, a triple-pillar already in Kyivan Rus [V.Y. Dovzhenok, 1961, p. 119-125], especially in the forest-steppe areas and the southern outskirts of the forest zone. In the main territory of the forest zone in the XI-XIII centuries. there is an intensive transformation of paddy fields into fields of long-term use, which began earlier. Such fields could be cultivated both according to the fallow system [Rasynsh A.P.. 1959, 1959], and according to the steam system in the form of a double field, a variegated field, and sometimes a tripilla [see, e.g.: Kochyn G.K., 1965, with. 91; Moore X., Leagues X., 1969, p. 5; Krasnov Yu.A., 1973, p. 37; G. Ya. Korobushkina, 1979, p. 96-102].

CHAPTER 5

MANAGEMENT OF SOHA EVOLUTION IN EASTERN EUROPE

The features of the plow, which make it possible to distinguish it from other plowing tools, and the scope of its application should be considered on ethnographic material. Ethnographic data also make it possible to at least roughly outline a number of important questions of the early history of this tool.

Tools, the most characteristic feature of which is the presence of a bifurcated working organ, two teeth [Zelenin D.K., 1907, p. 20, 21. see also Sreznevsky I.I., 1912, vol. III, stb. 469; Vasmer M., 1955, p. 703].

The word "sokha" in the sense of a plowing tool is East Slavic and is not found in the languages of the South and West Slavs. This may indicate its relatively late emergence - in the period when the common Slavic language no longer existed. It is important to emphasize that among non- peoples who used ploughshares, along with their local names, often identical or close to the name of the ral, there were terms derived from the word "ploughshare". Thus, among Estonians plows were called "ader", "sahk", "sahkader", "harkshak" [Feoktistova L.X., 1980, p. 65], among the Chuvash - "aka", "akapus" (that is, plowing tools in general) and "sahapus" [N.V. Nikolsky, 1929, p. 24; Vorobyov N.Y., Lvova A.N., Romanov I.R., Simonova A.R., 1965, p. 144], among the Germans - and "Stagntta", "Soche" [Leser P., 1931, p. 321]. Among the Volga Tatars and Bashkirs, the names of plows (respectively "suka" and "huka") are borrowed from the language [N.A. Khalikov, 1981, p. 61; Yanguzyn R.3., 1968, p. 323]. A similar phenomenon is observed in most Finno-Hungarian peoples [Maninnen J., 1932]. These circumstances can serve as an important argument in favor of the fact that the Sokhs came to the non- peoples of Eastern Europe from the Eastern Slavs.

Among plowing tools, called plows, the most representative and

widespread group are the so-called or Great plows, the structure of the body of which has distinctive features. The name " plow", firmly established in the literature, is quite conventional: plows of the same structure were used not only by s, but also by Belarusians, Ukrainians, Finns, Hungarians, Baltics and Turkic peoples of Eastern Europe. In the XVIII-XIX centuries. the range of the plow stretched from the Baltic in the west to the Urals in the east and from the northern limits of the spread of agriculture in Eastern Europe to the southern limits of the forest-steppe, mostly coinciding, however, with the subzones of coniferous and mixed forests, where podzolic and sod-podzolic soils prevailed [D. Zelenin, 1907; Novikov Yu.F., 1962, p. 461-463; H.G. Gromov, 1967; Naidych D.V., 1967, map 1]. The plow was brought to Siberia by immigrants. There have been cases of plow use in the central regions of Ukraine [Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, p. 56] and in the Volga steppe [Zelenin D., 1907, p. 138, 164-166].

In some areas, the plow differed in the details of its construction, but everywhere it preserved the general scheme of construction and specific features of the construction of its constituent parts (Fig. 3, 82). Its main part was a rossokha - a wide plate or board curved in the longitudinal plane and, as a rule, bifurcated at the lower end, which forms the working part of the tool (Fig. 3, 1, a). If there was no suitable tree for whole beams, they were sometimes made of two separate curved beams fastened with crossbars. The beams, which consisted of separate beams, are historically younger than the solid ones [Zelenin D, 1907, p. 45, 46]. The most common name of the working part of the plow - "rossoha" - is related to the name of the tool itself and emphasizes its two-toothed nature, other names - "dam", "plakha", "flesh", "svara", etc. - indicate the density and strength of this part. Rossoha functionally corresponds to the ralnik in the rales, but differs significantly in structure. Its length was determined by the height of the plowman and did not exceed 0.9-1.05 m. The width of the plow teeth is always smaller than the width of the ploughshare of single-tooth plows.

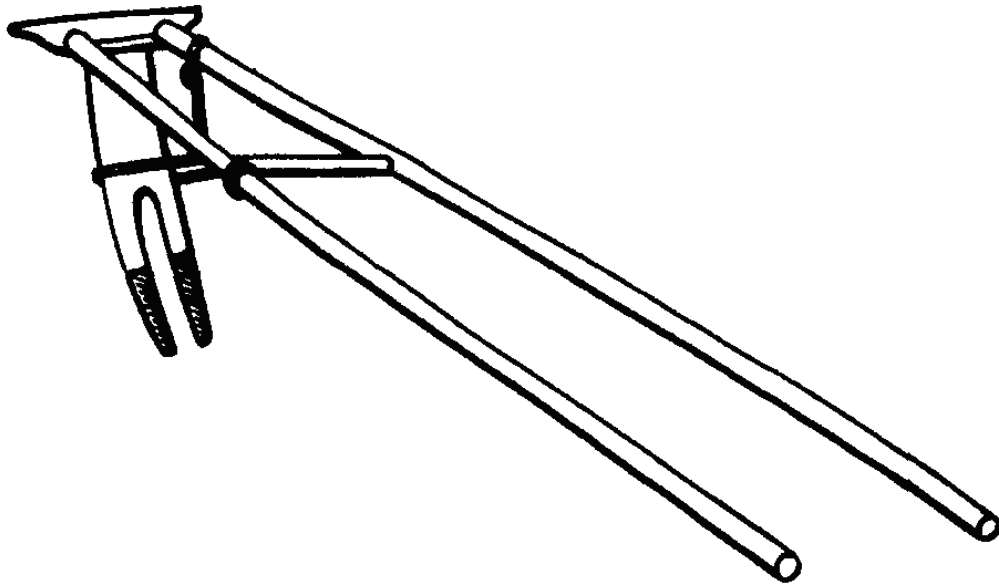


Fig. 82. Plow of the "Great " type without a shelf, according to D. V. Naidych

plowshares of the XVIII-XIX centuries were, as a rule, two-toothed. As an exception, there are known, on the one hand, single-toothed, and on the other hand, multi-toothed tools, which in the rest have all the signs of the plow. Data on multi-toothed tools with a coulter body (Fig. 83, 1) are limited, dating back to no earlier than the 19th century. and belong to the population of certain localities of the former Arkhangelsk, Kostroma and Novgorod provinces [Obozrenie selskogo hazyastva..., 1836, table. II, No. 2; I. Pushkarev, 1845, p. 52; Novgorod collection..., 1866; Agricultural statistical data..., 1903, p. 313; A.K. Supinsky, 1949]. There is also scanty data on single-tooth plows (Fig. 83, 2, 3), known in some localities of the former Novgorod region [Naydych D.V., 1967, p. 39] and Vyatskaya [Materials for agricultural statistics..., 1885, p. 93] province. Some types of improved saws of the end of the 19th century were also single-toothed. [Vargin V.Ya., 1897, p. 55, fig. 81; D. Zelenin, 1907, p. 161]. In the old literature, other tools were sometimes called single-toothed axes - chisels and "drafters".

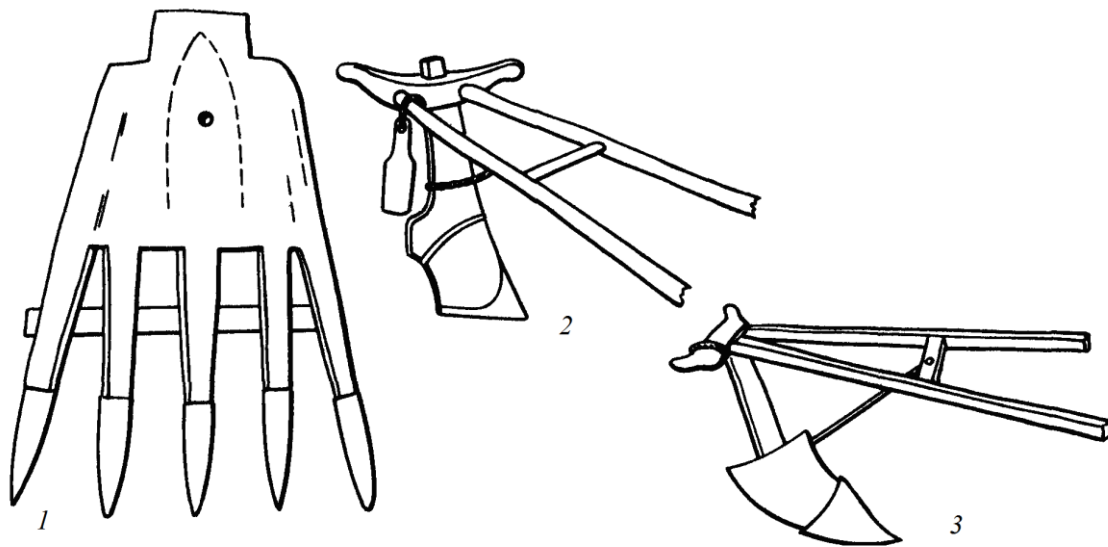


Fig. 83. Multi-tooth and single-tooth plows

1- five-tooth plowshare (according to A.K. Supinsky); 2 - a single-tooth plow from the former Perm region. for (D.V. Naidych); 3 - a single-tooth improved plow from the former Perm region. for (D.V. Naidych)

On the teeth ("horns" or "legs") of the rossohy, which were up to 40-50 cm long, iron sleeve tips were put on (see Fig. 3, 2), which were called "soshniks", "omesh", "ralniks". According to the samples we measured, their length was from 21.5 to 45 cm. According to the relative width of the sleeve and the working part, they are divided into circular and feather. In circular coulter, which often had a symmetrical blade, the width of the sleeve and blade is the same, in feather blades it is wider than the sleeve, asymmetrical and has the appearance of an elongated equilateral triangle. The coulters were planted on the "legs" of the withers at a certain angle to each other, so that they could form a trough-like furrow. Plows with different types of coulters are called circular and feather plows, respectively. The latter in the 19th and early 20th centuries. were the most common in the entire range of plows. Unlike rals, which in the recent past were often used without iron tips, plows usually worked with the latter.

This circumstance, as well as the origin of the name of the plow, can be considered in favor of its relatively late appearance.

The upper end of the rossoha was attached to the rogal - a horizontal beam located perpendicular to the direction of movement of the tool, the ends of which usually served as handles. In some of the saws, the rossoha was dug into the log from below, being fixed in it with wedges (see Fig. 3, 1), in others - it was clamped between the log and a parallel beam - a log, the ends of which were tied (Fig. 84). The first are called hornets, the second - root. Horned plows are probably older than Koryntsev plows [D. Zelenyn, 1907, p. 30]. There are no analogues of the Rogal among the parts of plows and plows.

The plow was intended for a one-horse harness, although there were exceptions. Therefore, the device for harnessing domestic animals took the form of two oglobels, which functionally correspond to the shafts of plows and plows, but differ sharply in terms of construction (see Fig. 3, 1c). Two main methods of hitching in a plow are recorded: the most common - without an arc, when the plow had short dowels, in the front ends of which holes were made for pegs, for which the collars were tied to the collars, and with the bow, to the ends of which the doves were tied, in this case longer. Sometimes, both goblets or only the right ones were made crooked. The rear ends of the oglobels were usually hollowed into a rogal, and at a distance of about one and a half arshins from it, they were fastened with a transverse beam, which was called a crossbar, support, spindle, stepson, etc. (see Fig. 3, 1, d). Thus, the plow is characterized by a high, at the level of the plowman's hands, location of the place of application of traction force. In plows intended for work on old arable soils, the back ends of the plowshares were sometimes not connected to the plow, but dug into the upper part of the plow [Naydych D.V., 1967, p. 37, fig. 6, tab. III, 1, VIII, 1-3], which was achieved by lowering the place of application of traction force.

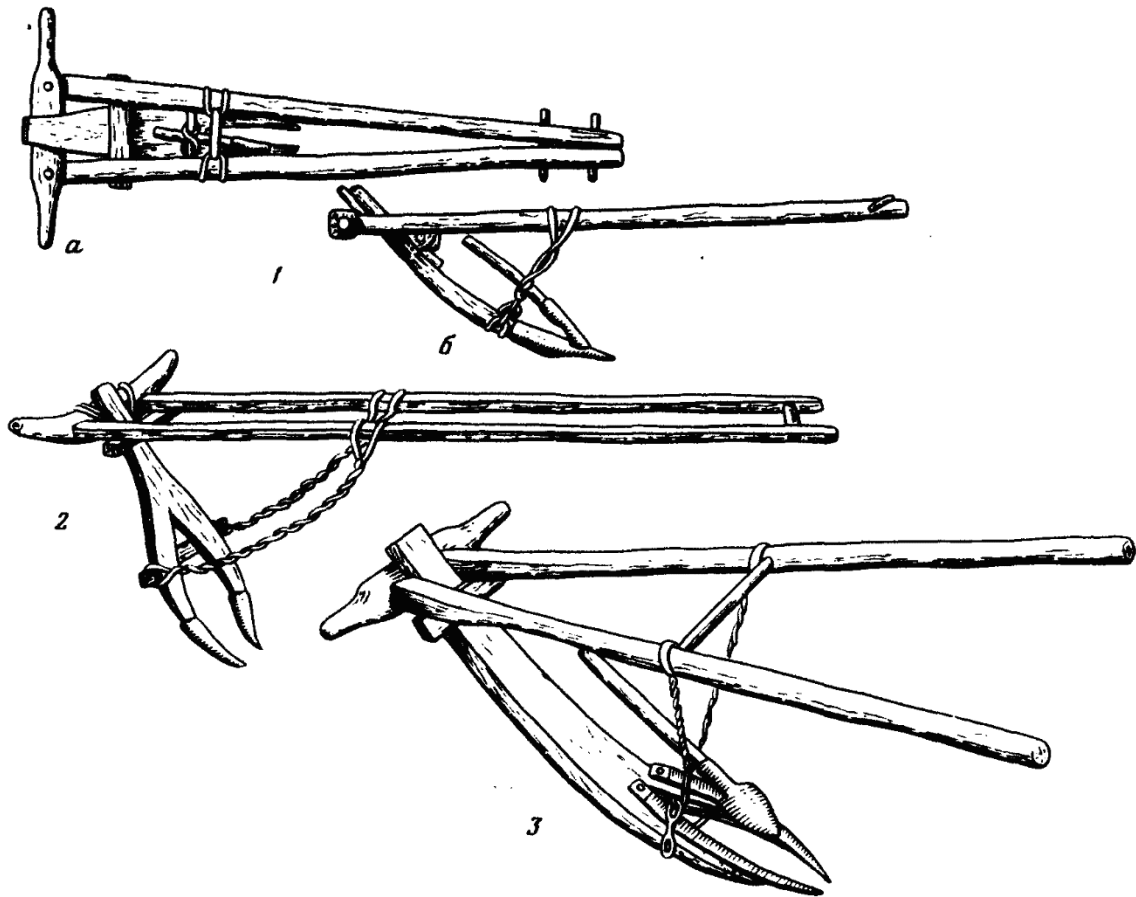


Fig. 84. Sokhi from Estonia (according to L.H. Feoktistova):

On the outskirts of its range, where the neighbors of the plow were other plowing tools, sometimes a team of two bulls or oxen was used, as well as a steam-horse team. When adapting a plow for a double team, the golobli were sometimes made such that they converged in front, and bulls were harnessed to their end, as to the shaft of a plow (Fig. 84, 1, 2). In other cases, the dowels were shorter than usual, and in the middle of the crossbar, a drawbar or drawbar was attached (Fig. 85, 2). In Lithuania, as well as in the Siberian "wheels", the shaft was sometimes dug into the rogal or in the dry area slightly below the rogal. "Wheel plows", which had a wheeled front, are a late modification of the plow, which appeared, apparently, only in the 19th century. [Zelenin D., 1907, p. 60, 61]. Thus, with a pair of harnesses with a shaft, either golobli (in a modified

form), or rogal, or both were kept in the plow. This suggests that pair plows are historically later than single horse plows with planers.

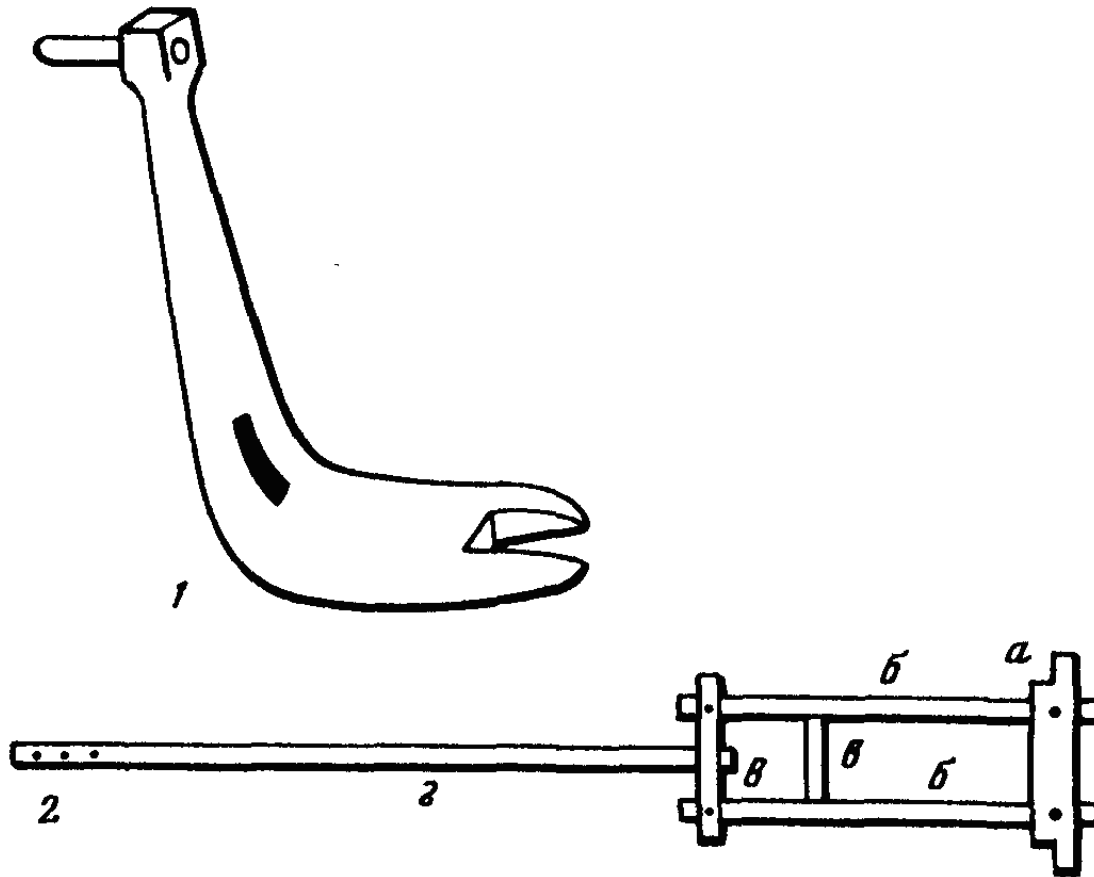


Fig. 85. Details of a soh with elements of a ral, Ukraine
(according to V.F. Horlenko, I.D. Boyk, A.S. Kunitsky):

- 1- rossoha in the form of a handle-plow construction, borrowed from a plow with a handle design, but with a two-toothed working part;
- 2- attachment to the plow for a pair of sleds with a drawbar, (top view); a – bagel; b – golobli; c - crossbar, on the right - ordinary, on the left - adapted for attaching a drawbar; d - drawbar

The working part of the plow was connected to the plowshares by a flexible connection - rope, rope or bar rootstocks that ran criss-cross from the lower part of the plowshare to the middle of the oglobels and the crossbar

between them (see Fig. 3, 1, e). With the help of rootstocks, the tool was given a certain rigidity, and the angle at which the working part entered the soil was also set. This, along with the harrow, determined the depth of plowing. Rootstocks played, thus, the same role as a stand in plows and plows, but this function received a different design solution in plows. Only at the end of the XIX century. soft rootstocks were sometimes replaced by a wooden rod ("rod") or an iron rod with screws at the ends.

Thus, the plow in its typical and most common form in its shape, it differs from plows and plows, as well as other types of plows by a set of features characterizing the structure and method of connecting the main parts, which include:

- a) manufacturing of all main parts of the tool from separate parts;
- b) connection of the working part and the device for harnessing animals using a horizontal bar located perpendicular to the direction of movement of the tool;
- c) using the ends of this beam as handles;
- d) high (usually at the level of the plowman's hands) location of the place of application of traction force;
- e) bifurcation of the working part, double teeth, although rare single-toothed and multi-toothed tools are known, which have other signs of plowshare;
- f) use of rope, rope or rod connections between the working part and the device for harnessing animals to stiffen the tool and adjust the plowing depth;
- g) one-horse sled, due to which the device for harnessing domestic animals takes the form of two golobels.

These features in their totality form a characteristic coulter body, which is not found in other plowing implements. The parts that make up its composition can only be approximated in terms of functionality with the most important details of these latter; the constructive solution of each of them and the tool in

general is significantly different.

Having, in principle, the same body structure, plows differed in functional characteristics, which was connected with the presence or absence, as well as the method of installing one more part - a shelf.

Functionally, the simplest type were plows without a shelf with an almost vertical setting of the plow, short and straight circular coulter. Such plows (see Fig. 82) plowed very shallowly, only "scratched", "scratched" the ground from above. By the nature of their work, they are close to RAL without shelf devices with an inclined working part and a high location of the place of application of traction force. Plows without a shelf include the so-called "tsapulka" and part of the "fall" or "undercut" ploughs, which were used on lands recently freed from the forest [Preobrazhensky A., 1858, p. 79; D. Zelenin, 1907, p. 21-23; Tretyakov P.Ya., 1932, p. 32; H.G. Gromov, 1958, p. 145; Feoktistova L.X., 1980, p. 122, 123], as well as "cherkusha" ("cherkuha"), which was used in combination with other tools for secondary plowing, plowing seeds, turning up and plowing potatoes, etc. [Naydych D.V., 1967, p. 37].

Plows with a transfer shelf or transfer plows were more complex (see Fig. 3, 1). D.K. Zelenin describes the shelf of saws as follows: "The shelf has mostly the appearance of a blade, but of different shapes: sometimes it is narrowed to the bottom, sometimes it is narrowed in the middle, etc. It is almost always somewhat humped, that is, it looks like a trough; this is mainly for the convenience of placing the shelf on a plow. The shovel of the shelf is iron, and the handle is wooden; for attachment to the handle, there is a tube (tube) in the shovel" [Zelenin D., 1907, p. 39]. Known shelves in the form of a straight wooden or iron stick [Dashkov V., 1842, p. 77]. Perhaps this form of them preceded the one described above [Kochyn G. E., 1965, p. 132, 133]. In plows with rootstocks, the shelf was fixed with the handle of these latter, if there was a rod - it was tied to it. It was fixed in such a way that it could be transferred from one coulter to another.

The functional role of the shelf (see fig. 3, 1, f, 3) is twofold. On the one hand, it grinds, loosens the soil layer raised by the coulter, grabs it behind it, which is similar to additional looseners and double row shelves. A shelf in the form of a simple stick performs the role of loosening the soil layer only. On the other hand, the transfer shelf to a certain extent turns the raised and loosened earth to one side and then to the other. In this way, it is again close to additional plows or a plow shelf, but due to its small size and method of installation, it is far from identical to the latter. Plows with a translational shelf should be considered transitional from plowless tools to plow-type tools in terms of their functional qualities, and they are closer to the former than to the latter.

Some of the reciprocating plows had an almost vertical arrangement of the harrow, as in shelfless plows, in others the coulters entered the soil almost horizontally. They had both feather and circular coulters. The latter were more often used in drying with close to vertical setting of the drying rack. There were practically no differences in the structure of the body of the folding and shelfless plows.

The next type of plows from the point of view of their functional features were plows with a fixed shelf or side plows, which were always equipped with feather coulters (Fig. 86). The simplest of them differed from movable plows only in that one of the coulters (usually the left one) was installed in them vertically (standing with the edge), and the second - horizontally (lying on the bed), and the shelf was fixed immovably on the coulter which (standing with the edge) [D. Zelenin, 1907, p. 53]. In this way, it was possible to cut the skirt from below and from the side and turn it over to one side. Functionally, such implements already belonged to plow-type implements. The coulters of the simplest one-sided plowshares did not differ in shape and size from the feather coulters of the reciprocating plowshares. In fact, only a basic readjustment of the coulters and the shelf was required to convert a single-sided plow into a folding plow and vice versa¹. In the future, the one-sided harrows began to make special

protrusions that contributed to the turning of the soil to one side, the shape of the left coulter also changed, some plows got combs, etc. [Zelenin D., 1907, p. 56-62, 65-66; Naidych D.V., 1967 p.40]. On the basis of one-sided plowshares, a roe deer was created - a new plow-type tool that had a single working part, but retained the coulter body [Tsellinsky F., 1854; D. Zelenin, 1907, p. 67-82].

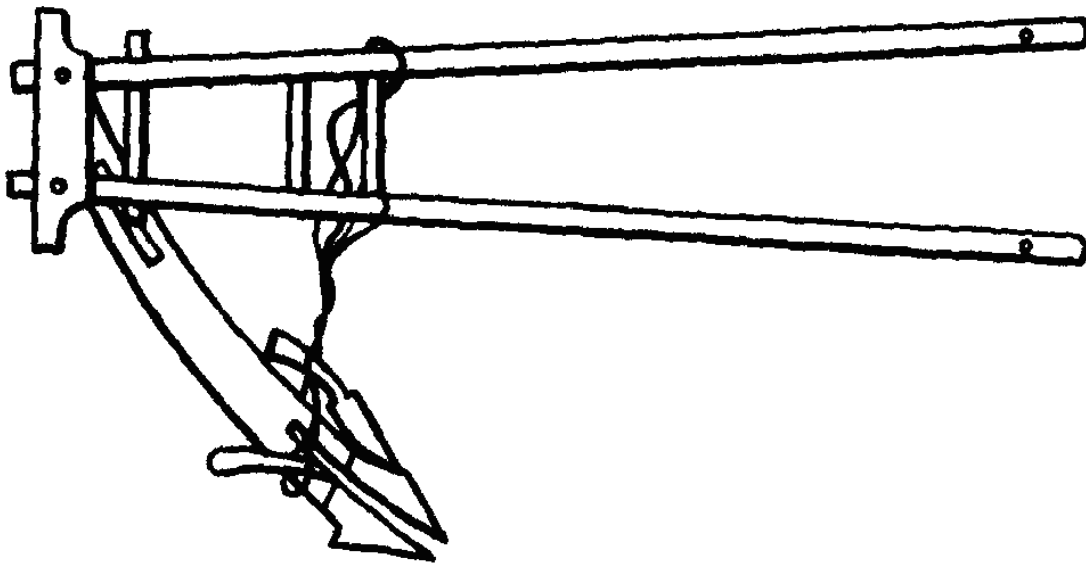


Fig. 86. One-sided plow from Eastern Polissia (Ukraine)
(according to V.F. Horlenko, I.D. Boyk, A.S. Kunitsky)

Plows without a shelf, movable and single-sided, in principle, were the same in structure, but differed in terms of functionality, and were simultaneously historical stages of the development of the plow.

In the XVIII-XIX centuries. the plow was a universal tool in the peasant economy. The main field of use of rotary and one-sided plows is primary and secondary plowing of old arable land with a steam system and the production of manure and seeds. The portable plow was inconvenient to work on new plots and therefore was rarely used here. This drawback was eliminated by the appearance of one-sided sohs. Plowing of heavy and heavily sodden soils could

also be carried out with transfer plows, but in combination with a "drawer" (other names: "cutter", "cut", "cut", etc. - Fig. 87, 2). According to the description D.K. Zelenina, the "draftsman" has the appearance of an ordinary plowshare, which instead of a rake has a straight leg - a strong, almost straight bar without a bifurcated end. An iron triangular knife is placed on the lower end of the paw... point forward. Very often it serves as an ordinary ploughshare ... only planted with the point forward" [D. Zelenyn, 1907, p. 63]. In the 18th-19th centuries, "plotters" were distributed in various places of the range of the plow - from the Baltic to the Urals and from of the Northern Dvina basin to the south of Belarus. In Estonia, "drawing tools" created on the basis of the ral were used [Feoktistova D.X., 1980, Fig. 39, 1]. The names of this tool among the Baltic peoples (lit.: resokas, atresas; Lat. - riezasks, resa; Est. - rees) come from the terms "rez", "rezak", "otrez".

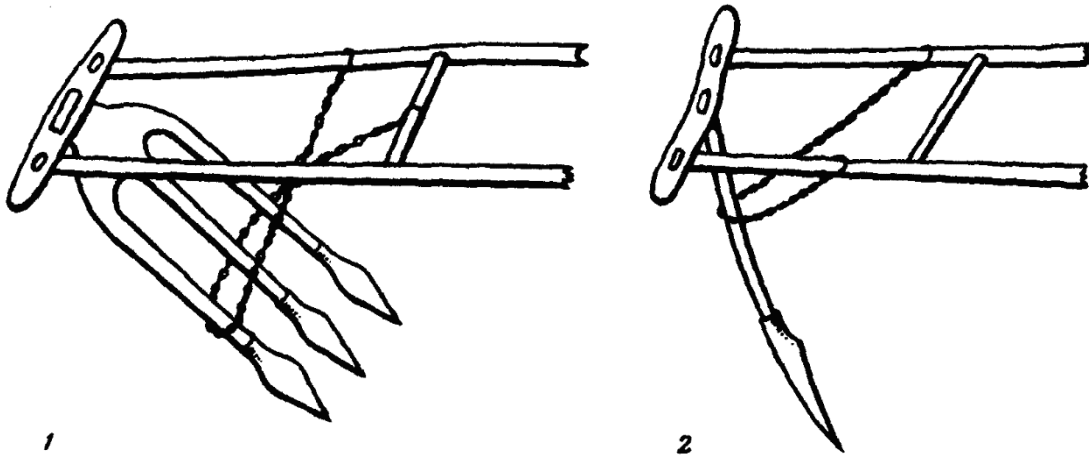


Fig. 87. Sokhi (according to drawings of the middle of the 19th century):

1- trident; 2- draftsman

Two-toothed plows without a shelf, and sometimes movable plows, were also widely used during the cultivation of fields recently freed from the forest

[Tr. VEO, 1867, part 4, p. 45; part 13, p. 16 - 18; Preobrazhensky A., 1853, p. 79; D. Zelenin, 1907, p. 22, 23, 154, 161, 182; Tretyakov P.P., 1932, p. 32; H.G. Gromov, 1958, p. 145; D. V. Naidych, 1967, p. 56, 57; Feoktistova L.X., 1980, p. 122, 123], but not under clear-cutting agriculture, but under the conditions of forest fallow or the transformation of fallow into permanent fields.

Multi-toothed plows, unlike two-toothed ones, were primarily used for secondary tillage, sometimes acting as harrows [Novgorodsky collection..., 1866, p. 24, 25; D. Zelenin, 1907, p. 121, 122, 152]. The fact that contemporaries characterize them as "something in between a plowshare and a harrow" can testify to the functional purpose of the multi-toothed Arkhangelsk ploughs-"throwers" [Agricultural statistical data..., 1903, p. 313]. Presumably, multi-toothed plows, like multi-toothed Ukrainian plowshares, were tools with a narrow functional purpose and appeared, like the latter, relatively late [Zelenyn D., 1907, p. 19]. There is no information about the specifics of the use of single-tooth saws in the sources.

Let's turn to the characteristics of other varieties of Eastern European sohs, which differ from ones in their body.

One of these varieties is a plow with "cranes" and a long wither (Fig. 88, 1 - 3), common in the northern and central parts of Estonia [Feoktistova L.X., 1980, p. 65, 66, fig. 14-18, map fig. 26]. Their double-toothed saw was long and, unlike saws, straight. The oglobli was made from a spruce trunk (a part of the trunk with roots) so that the trunk served as a bare oglobli, and the part of the root, bent upwards, formed the basis of the handles (kured - crane). At the upper end of these latter, a crossbar was stuffed, the ends of which served as handles. The rossoha was fixed in the oglobly with the help of two bars, like it was done in root plows. In the case of the drawbar (shaft) harness, which was very common in such plows, the shaft was also made from a pit, and its rear end at the place of installation of the shaft was bifurcated and bent upwards with "cranes". Rootstocks were made of rods or rope, occasionally - of chains. Such tools had a

low location of the point of application of the traction force, and the saw moved in them during operation in a position close to horizontal. Plows with "cranes" had the usual translational share, as well as long and narrow sleeve circular coulter, were larger and heavier than the ones. Although such tools were close to the plow according to the general scheme of the design and the structure of some parts, they clearly have features characteristic of plowshares that were used in Estonia, with a plow share and a sharer that was inserted into the lower face of the share [Feoktistova L.X ., 1980, fig. 10, 11, 12a]. This makes it possible to distinguish plows with "cranes" from plows identical in design to plows, also common in Estonia and neighboring Baltic regions [Leynasare I., 1957; Feoktistova L.X., 1980, p. 76-82]. Plows with "cranes" were used, as a rule, on old arable lands under the steam farming system.

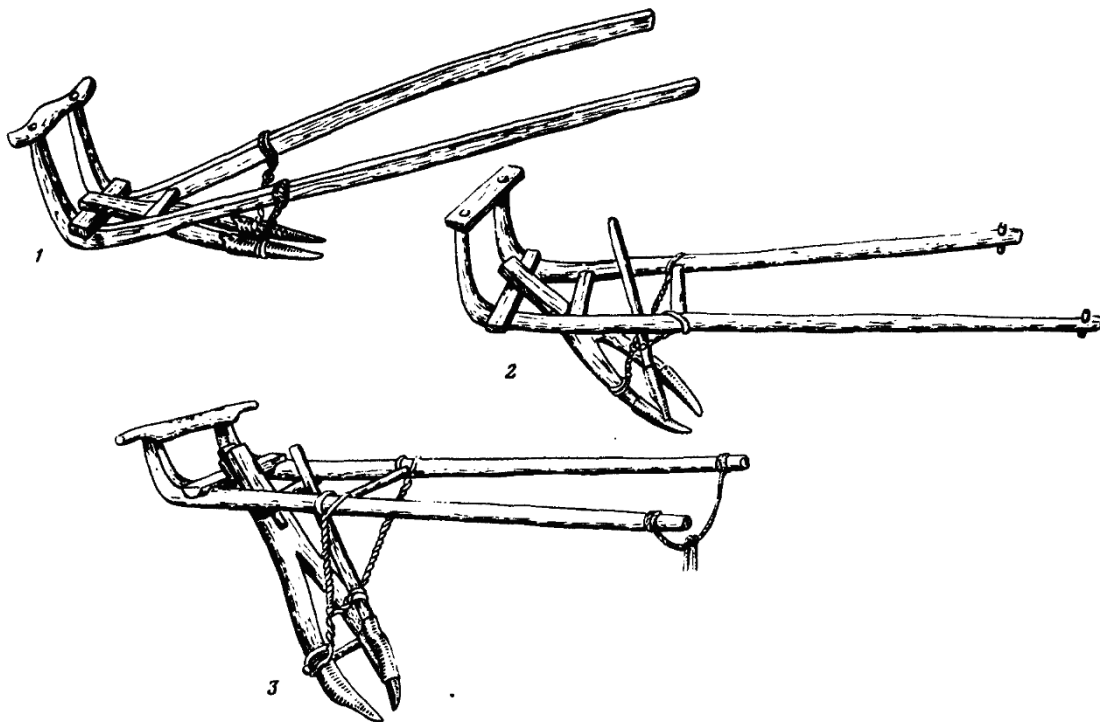


Fig. 88. Estonian plows with "cranes" and long rasso
(according to L.Kh. Feoktistova) (1-3)

Much closer to the ral is the so-called North Estonian plow with long "cranes" and a short withers [Feoktistova L. X., 1980, p. 71-73, fig. 19, 20], which was also used mainly on old arable land (Fig. 89, 1, 3). The short two-toothed shaft of such guns cut into a straight shaft from below, the rear end of which, bifurcating, bent upwards in the form of "cranes". In the case of a one-horse harness, the shaft was made short and the dowels were attached to it with the help of two crossbars. Adjustment of the drying position was carried out, as in RAL, with a wooden or iron rack between the harrow and the working part. These tools are related to the ax only by the presence of a double-toothed ax (which was usually made straight) and sometimes - a shelf (in most cases, these tools did not have a shelf). It is no accident that G. Rank, who first described this tool, considered it a two-tooth plow [Ränk G., 1938, p. 120].

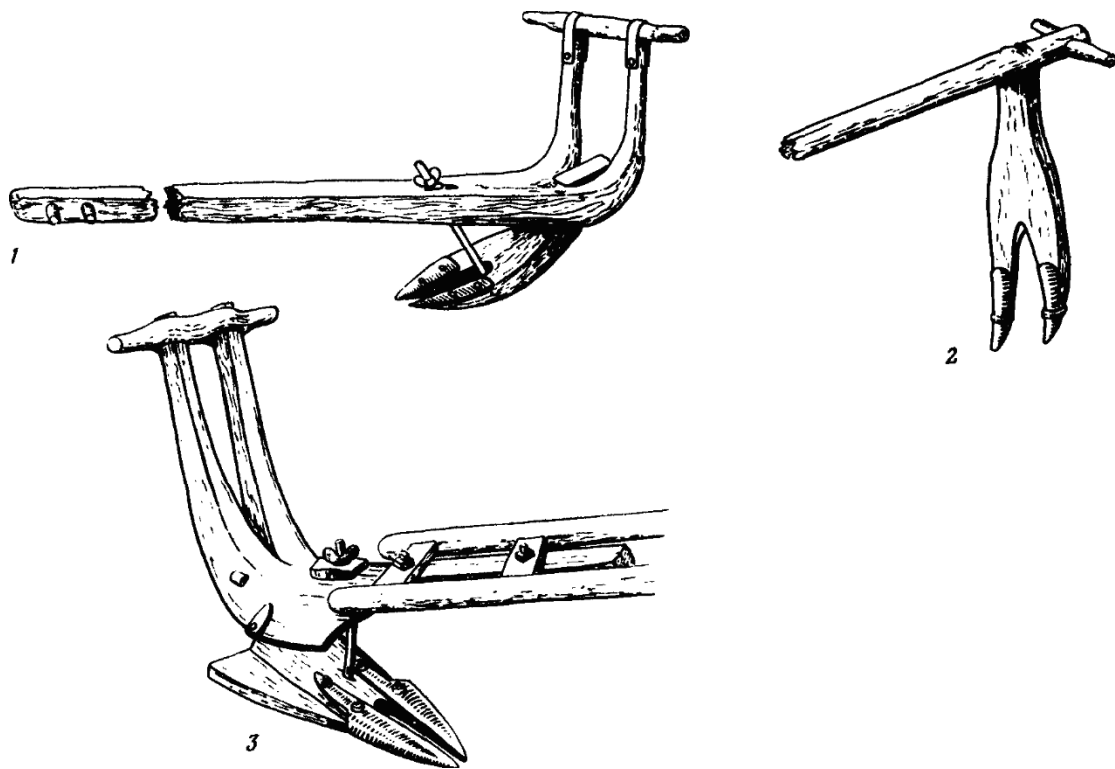


Fig. 89. Plows:

1, 3 - Estonian plows with long cranes and short boom

(according to L.X. Feoktistova);

2- Karel'ian plow with harrow (according to K. Mozhinskyi)

The original Karelian plow is close to the North Estonian plow with long "cranes" and a short boom (Fig. 89, 2). It did not have a rogal, and a narrow two-toothed awl was hollowed into the rear end of a straight shaft [Moszynski K., 1929, fig. 141]. In Olonetska province. in the 18th century were known to be similar in structure to plowshares with a harrow hollowed out, however, in a rogal. A two-toothed rake with narrow, needle-like coulter was attached to them at the rear end of the shaft [Weile K., 1923, p. 100; V. S. Mamonov, 1952, fig. 29].

The Lithuanian or Polish plowshare (folk names: horn plow, horn plow, parovitsa, Soche, Stagutta, etc.), common in the 18th-19th centuries, has a significant similarity in the general design scheme with the North Estonian plows with long "cranes" and a short shaft. in the Ukrainian and Belarusian Polissia, in places in the south of Lithuania and in the eastern part of Poland, as well as in the territory of the present Kaliningrad region. [Michelson V., 1849; D. Zelenin, 1907, p. 54, 55; L.A. Molchanova, 1968, p. 15-18; Gorlenko V.F., Boyko I.D., Kunytskyi O.S., 1971, p. 58-60]. The basis of these tools (Fig. 90), which were usually intended for a pair team (sometimes several pairs of bulls were harnessed to them), was a long and massive straight shaft, the rear part of which was usually bent up and bifurcated, forming two handles. Less often, the handle was formed by a separate part that was inserted into the rear end of the shaft. A bifurcated, straight or less often slightly curved forward was inserted into the shaft from below. Rootstocks were made of rods, rope or belt, sometimes replaced by a rack. There are known cases of using such plows with a wheel front (Fig. 90, 1). Some of them had a fixed shelf in the form of a shovel, while others had shelf devices in the form of narrow boards, which were inserted into the sleeve of the left (shelf) and right (rest) coulter, which made it possible to dump the earth on the left side. In Chernihiv Oblast, horned plows with a shelf in the form of a board, like a plow, were known. The coulters of the Polish plows were always feathered, characterized by generally larger sizes than

those of the plows, their left plowshare differed in shape from the right one. According to their functional features, Polish plows belonged to one-sided plows. They are related to the saw only by the bifurcated working part, the use of soft rootstocks and the relatively rare use of a shelf in the form of a shovel. In the rest, they were similar in design to straight-blade plows with a straight blade inserted into the plow from below. They were used for tillage of fields, as well as on old lands with tripilla.

These varieties should be considered as contamination types that combined the features of the plow and plow. It was not by chance that they were spread at the junction of the areas of plowing and plowing. It is quite clear that historically these tools must be younger than plows.

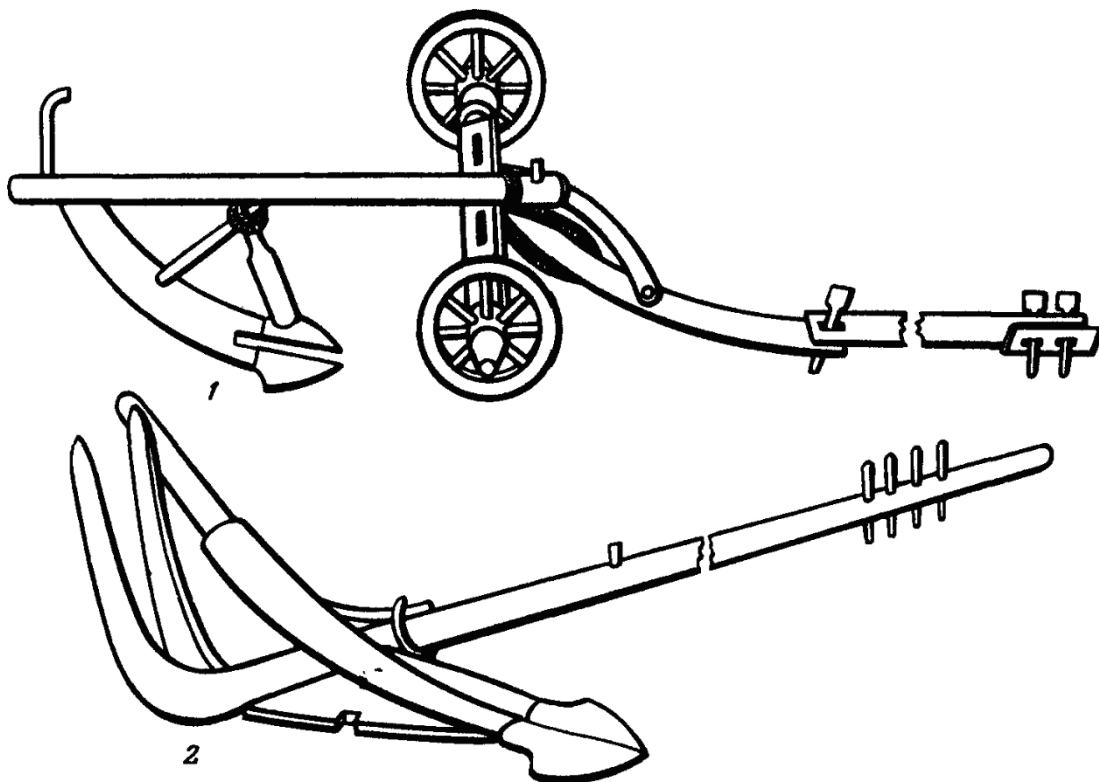


Fig. 90. "Polish" or "Lithuanian" plows:

1– Chernihiv Region (according to A. Güldenstedt); 2 - Polissia of Ukraine (according to V.F. Horlenko, I.D. Boyk, A.S. Kunitsky)

Bearing in mind the data about the plows of the recent past, which we got acquainted with through ethnographic materials, let's turn to written and iconographic sources.

The first mentions of plowing in written records date back to the 13th century. V.N. Tatishchev, passing on a chronicle report that has not reached us, about the payment of tribute to the Golden Horde in 1275 by Grand Duke Vasyl Yaroslavovych, notes that this tribute was collected "from all the land to half a hryvnia from the plow" [Tatishchev V.N., 1784, with. 47]. Here, the term "plow", like the earlier terms "plough" and "plow", acts as a unit of taxation. This can be seen as evidence that in the XIII century. the plowshare was a fairly widespread tool throughout the territory of Kyivan Rus. At the same time, it is mentioned in sources later than Rala². In combination with linguistic and ethnographic data, this circumstance acquires a certain sound and cannot be ignored. During the excavations in Novgorod, birch documents of the second half of the 13th century were discovered. [Artsikhovskiy A.V., Barkovskiy V.B., 1958, No. 96, 1963, No. 142], in which "omeshes" are mentioned - iron tips of the soh. In documents of the same and later times from the territory of Lithuania, Latvia and Estonia, there are mentions of plowing implements, which were called, like the plough, "aratriim", "nnkiis", "hacken", but which were harnessed by one horse [Henry of Latvia, 1938 , II, 7; X, 13; XXIII, 5; Senas Latvijos..., 1937, No. 146, 161, 367. See also: V.V. Doroshenko, 1959, p. 45]. Taking into account that a pair of sleds was traditional for ral, it can be assumed that part of the plowing tools with such names were plowshares. This assumption is indirectly confirmed by the fact that in the Baltic documents of the 14th and following centuries there is a tradition of considering the iron tips of plowing tools as pairs [Dundulene Ya., 1956, p. 5, 6; Doroshenko V.V., 1959, p. 46-47; Kochyn G.E., 1965, p. 69], which indicates their two teeth characteristic of ploughshares.

In documents of the XIV-XV centuries. There are numerous references to plowing, belonging to almost all regions of the country [Ya. Rozhkov, 1899; with. 111-116; Gorsky A.D., 1959, p. 22, 23; Kochyn G.E., 1965, p. 72, 73]. Mentions of the plow and especially of the plow at this time are rarer. As in the 13th century, the term "soha" continues to be used as a unit of taxation [PSRL, vol. XXV, p. 319-320; GVNP, No. 21, p. 39]. It is important to note that, judging by the sources, plowing on one horse was common in peasant farms ("one person plows on one horse..." [PSRL, vol. XXV, p. 320], which is typical of plowing with a plow. One cannot but agree with the opinion of G.E. Kochyn that "the written sources of the XIV-XV centuries provide sufficient material to talk about the widespread use of the plow in North-Eastern and North-Western Eastern Europe, moreover, as the main tool for cultivating the land" [G.E. Kochyn. , 1965, p. 72]. There are numerous, though less defined, data of this kind for the Baltic region [P. Dundulene, 1956; V. Ya. Doroshenko, 1959].

All these sources do not contain, however, any data on the structure of the plow. Some information of this kind can be obtained only from documents of the 16th - early 17th centuries.

In most cases, it was customary for them to consider coulter in pairs, and to use collective numerals to indicate the number. So, for example, in the right deed of 1521 to the villagers of The Nova of Yuryivsky District states: "And the robbery... they took: from Fedekb a gelding... and an ax, and two plowshares... And from Ironka, the robbery took a mare... yes, two axes, and two plowshares... And from Onanka they took two rubles of money... and three axes and three coulters..." [AFZyH, 1951, p. 13, No. 1a]. In the monastery's revenue and expenditure books, the usual entries are: "...three coulters shared", "two coulters shared" [Historical Library, vol. XXXVII, p. 37, 62, 80] etc. In addition to paired coulters, the sources mention "unpaired" coulters, i.e., not separated into pairs, which are sold in bundles [Tamozhnye knygi..., 1957, p. 380] or

count individually [Nikolsky Ya., 1910; Expenditure books of the treasurer Eluvferia, stb. XLXI].

Special work was disassembling the coulter in pairs and planting them on a wooden base - "planting the coulters" [Historical Library, vol. XXVII, p. 295]. These data indicate that in the 16th - at the beginning of the 17th centuries. two-tooth plows prevailed, if they were not the only ones.

Plows with shelves are first mentioned in the right document of 1543 [Lykhachev N.P., 1895, p. 196, 197]. In the sources of the second half of the 16th century. and the beginning of the 17th century. "shelves", "shelf products", "shelves with shelves", "harrows with shelves" occur quite often, and shelves were often bought or repaired separately from harrows [Kochyn G.E., 1965, p. 76]. According to N.A. Gorskaya, mentions of coulters with shelves indicate that such documents refer to one-sided plows [Horskaya N.A., 1959, p. 153, 155]. While not excluding that there were already one-sided plows in Eastern Europe in the considered period, we note that such a conclusion does not follow from the specified sources. The frequent use of the expression "harrows with shelves" only indicates that these items were one set for plowing tools. In one of the documents of 1590, a "plow with everything for plowing" was mentioned, which emigrants to Siberia had to have [Archive of I.M. Stroeva, 1910, No. 374]. Here, obviously, we are talking about a fully equipped plow, the "working kit" of which included, in particular, coulters and a shelf. . The plow itself could be both translational and unilateral. Plows with shelves were used not only in the central regions of the state, but also in the north, for example in Kargopol [Gorskaya N. A., 1959, p. 161].

Some documents mention "big iron coulters" as well as "oral" plows [see, for example: Nikolsky N., 1910; Expenditure books of the treasurer of Pymen, stb. CLXXX, CLXXXVII]. According to N.A. Gorska, plows with "large iron coulters" were plow-type tools, close to the plow, and "oral" plows were used for secondary plowing after such tools, "for plowing land strewn with stones,

where heavy plows were less suitable, and also, perhaps, for wrapping seeds after sowing" [Horskaya N. A., 1959, p. 144, 161, 162]. In terms of functional features, it thus brings "oral" sokhas closer to Cherchushka sokha. It is difficult to agree with this assumption, because even in the middle of the 19th century. "oral" saws in a number of regions of Eastern Europe were not called Circassian saws, but single-sided saws, in contrast to "oral" saws - translational saws [D. Zelenyn, 1907, p. 141]. The very word ("plow", from which the name "oral" plows originates, in many dialects is better used to denote plowing with a roe deer and a plow [Zelenin D., 1907, p. 12], i.e. plow-type tools. Therefore, a relatively rare mention " "oral" sohs in the documents of the second half of the 16th century may rather indicate the use of single-sided sohs.

Very important for the characteristics of the 16th century plough. There is an entry in the revenue and expenditure book of the Chudova Monastery for 1586: "Three coulter with polizems and slats were given to elder Kirill in Nyvyshto" [Horskaya N.A., 1959 p. 155]. We will remind you that the "cut" (or comb) was widely used in plows, was a characteristic part of the helmet, and was also used in independent tools. In the document under consideration, it is characteristic that the sections are mentioned in one set with paired coulters and shelves. Only one variety of plowing tools had such a set of iron parts - a one-sided plow with a cut, which was rare in the 18th-19th centuries. It had the body of an ordinary transfer plow, coulters of different sizes and shapes and a "cutter" or "cut" that was inserted into the left goblet [Works of the Free Economic Society, 1773, part 23; 1808, part 60; D. Zelenin, 1907, p. 65-66]. Plows with a comb appeared later than ordinary one-sided plows and immediately preceded the invention of the single-plough roe. The presence at the end of the 16th century. a soh with a comb can serve, thus, as another confirmation that simple varieties of one-sided sohs could appear in Eastern Europe at an earlier time. Cutters in documents of the XVI-XVII centuries. are mentioned quite often [see, e.g.: Malynovsky A., 1821, p. 152; S. Shumkov, 1917, p. 407, No. 1125;

Gorskaya N.A., 1959, p. 155, 159]. Apparently, this may indicate the widespread use of special tools equipped with cutters - "drafters".

In the literature, the opinion was expressed that roe deer, created on the basis of a ploughshare, a plow-type tool with one ploughshare and comb, appeared in Eastern Europe as early as the 14th-15th centuries. [Smirnov P. I., 1946, p. 57; Essays on the history of the USSR, 1953, p. 28], also existed in Volga Bulgaria [N.A. Khalikov, 1981, p. 65]. Such assumptions can hardly be confirmed by the sources. There are no finds in the archaeological materials that could be unequivocally associated with the kocule. The oldest information about "roe deer plows" and "roe deer plows" can be found in the revenue and expenditure books of the Spaso-Prylutsky monastery for 1606-1609 and other documents of the 17th century. [Zaozersky A.A., 1937, p. 102-103; L.S. Prokofieva, 1959, p. 25; Kochyn G.E., 1965, p. 72]. But according to ethnographic observations, "the people call all one-sided plows roe deer" [Zelenin D., 1907, p. 53, 67]. This provision cannot be disregarded when evaluating the content of these documents. For the first time, the one-ploughed roe deer with a cutter is mentioned only in the description of agriculture in the Pereslav District of the Volodymyr Region. and Halytsky District of Kostroma Province. beginning of the second half of the XVIII century. [Proceedings of the Free Economic Society, 1767, part 7, p. 88, 92-93; 1768, part 10, p. 139].

iconographic material of the XVI-XVII centuries contains significant information about plowshares. It is possible that some of the miniatures with images of plows, as well as the drawing of the plow in the Radzivyli Chronicle, are copies of earlier images [Gorsky A.D., 1965, p. 34]. To date, about 30 images of plowing tools with a plow body of the XVI-XVII centuries have been published and described. These are miniatures of the manuscripts "Life of Sergius of Radonezh" from the second half of the 16th century, which were repeatedly published in various editions [for the date of the manuscript, see: A.I. Svyryn, 1950, p. 119], and the end of the 17th century. [Gorsky A.D., 1965, p.

22 - 23, fig. 8], the image of 11 sohs in two volumes of the Lytsev chronicle collection of the 16th century. [Gorsky A.D., 1962, p. 339-351; 1963, p. 13-22]. Art. i of the end of the 17th century, paschals around 1669 and the end of the 17th century, face collection of the end of the 17th century, saints of 1629, psalter of the beginning of the 17th century. [Gorsky A. D., 1965, p. 20-32, fig. 1 - 13], two lists of the manuscript "Mental Medicines" of the 17th century. [Art treasures..., 1963, fig. 60; Gorsky A.D., 1965, p. 20]. In addition, several images of two-toothed saws are known on the icons and frescoes of churches [Pervukhin N., 1915, fig. between 40 and 41; 1915, p. 22; Renaissance masterpieces, 1963, fig. 41).

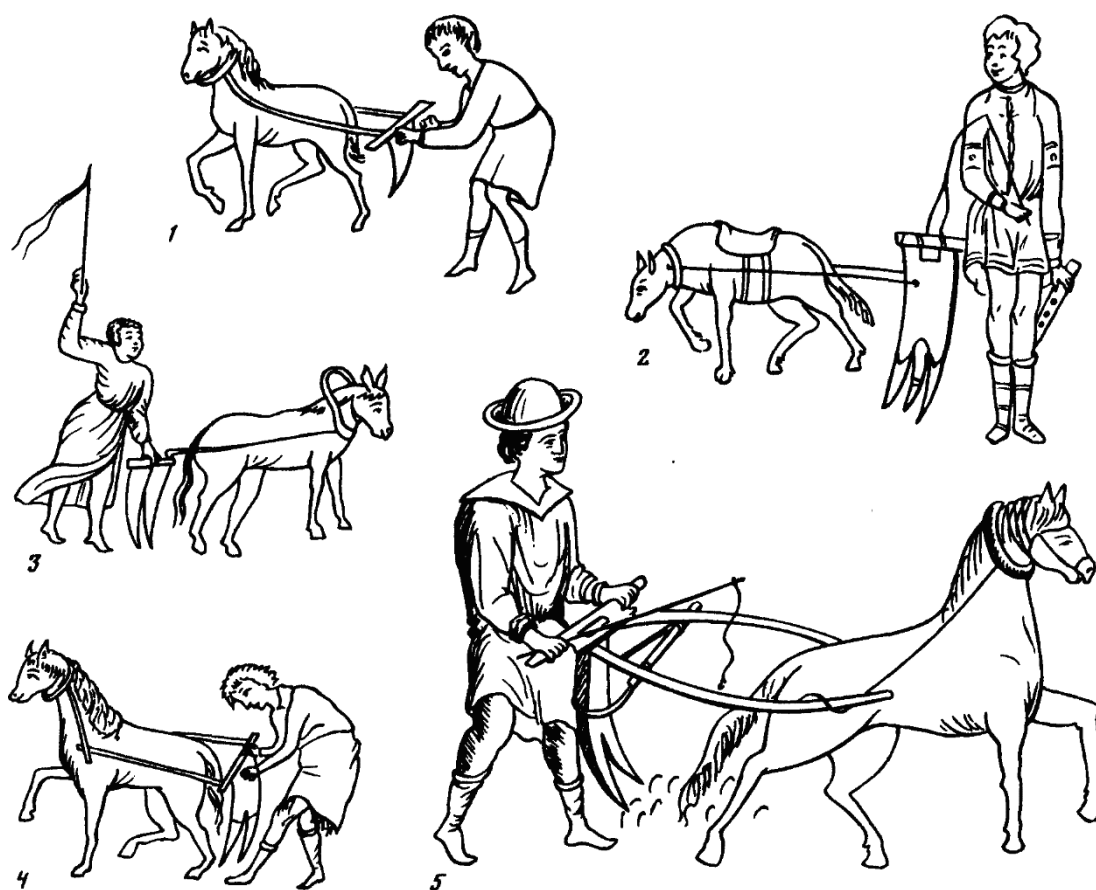


Fig. 91. Images of sohs on miniatures of the XVI-XVII centuries. (1-5)

Five of the indicated miniatures (from the manuscript "Life of Sergius of Radonezh" at the end of the 16th century and "Chronograph" at the end of the 16th - beginning of the 17th century) depict a trident tool (fig. 91, 2), on two [synodnik 40-60- X years of the XVII century. and the Apocalypse of the 17th century] - one-toothed (Fig. 91, 1). The rest of the miniatures, like the icons and frescoes known to us, contain images of two-toothed axes. The most informative, clear and realistic are the miniatures of the first volume of the 16th century Personal Chronicle. (Fig. 91, 5).

All images of three-pronged tools with a plinth body seem less realistic and hardly reflect the tools that actually existed. About the miniature "Life of Sergius of Radonezh" at the end of the 16th century. also P.N. Tretyakov said that "the details of the drawing do not inspire any confidence" [Tretyakov P.P., 1932, p. 29]. A detailed analysis of this miniature is given by H.E. Kochin, who believes that "...the miniature being disassembled cannot be a source for the study of the device of the plow of the XIV, XV or XVI centuries, nor even more so for the characteristics of the construction of the plow of that time" [Kochyn G.E., 1965, with. 58]. On the drawings of the "Chronograph" of the late 16th - early 17th centuries. the plow implements are shown as having the usual two-pronged one-piece shank. A third tooth, smaller in size, but also equipped with an iron tip, is drawn on the side or between the main teeth. Looking at these drawings, A.D. Gorsky notes that "constructive inconsistencies... do not allow us to see images of real tools in them" [Gorsky A.D., 1965, p. 22], although he does not doubt the existence of multi-tooth plowshares in the considered period. The location, size, and partly the shape of the third tooth on these miniatures give certain reasons to see in it an unsuccessful attempt to depict a shelf, and to consider the tools themselves as two-tooth plows with shelves.

The vast majority of considered miniatures show a one-horse team without a bow, occasionally - with a bow. An exception is the miniatures of both lists "Life of Sergius of Radonezh", where plowing implements have a

fantastically detailed three-horse team. Almost all the miniatures clearly show the image of the collar, sometimes - the saddler and saddler, as well as the turrets. On the miniatures of the Lytsovo chronicle vault of the 16th century. short golobles are shown curved (Fig. 91, 5), on the rest - straight. Some miniatures show a sled without a bow, but as if with long gobels, as if attached to a collar [for example, miniatures of the "Chronograph" of the late 16th-early 17th centuries, synodnyk of the 40s-60s of the 17th century, Paschal and the Apocalypse of the 17th century.]. Perhaps this should be considered as a convention of the image, when short golobles and bumps merge into one line.

Rozsokha on miniatures of the XVI-XVII centuries. in most cases, it is shown as a whole, its thickness and massiveness are emphasized. Some miniatures of the Lytsovo chronicle vault (for example, sheet 51) make it possible to suggest that the rossoha was made from a pit. In all miniatures, it is more or less curved in the vertical plane. On the drawings from the paschal and synodnyk of the 17th century, as well as on icons, the rossoha is depicted as two separate teeth, which are connected at the top by a hook (Fig. 91, 5). This gave rise to A.D. Gorskyi believes that plows with compound rosy are shown here. However, these drawings are schematic, and the specified feature may simply be a convention of the image.

Most of the miniatures clearly show a rogal in the form of a thick, often hemmed from the ends of the beam and a groove in it, into which the rossoha was inserted (Fig. 91, 5). Root plows are not shown in the miniatures. The oglobli are usually shown hollowed out in the rogal. But there are exceptions: these are miniatures of the "Chronograph" of the late 16th and early 17th centuries. (Fig. 91, 2) and a drawing from Paschaly around 1669. Here the rear ends of the oglobels are connected to the upper part of the rossoha. The crossbar and rootstocks are depicted only on the miniatures of the first volume of the Lytsovo chronicle vault of the 16th century.

Many, but not all, Old images of saws convey iron tips, dressed on the teeth or "legs" of the saw. They are often painted in a different color than the rossoha and other wooden parts of the tool. All coulter in such images have a width that does not exceed the width of the "legs" of the coultter, that is, according to this feature, they should be close to circular ones. But in the archaeological material of the XVI-XVII centuries. openers with a feather are not uncommon, so the specified feature of the images can also be explained by the conventions of the drawing.

There is an undisputed image of the shelf only on a miniature manuscript of the late 16th and early 17th centuries. "Peacemaking Circle" (Fig. 92). The shelf is depicted here in the form of a blade, tapering downwards, mounted on a long, possibly wooden rod. It lies on the left coultter. It is impossible to understand from the picture which plow is in front of us - translational or one-sided.



Fig. 92. A scene of plowing and sowing from the book "Circle of peace"

Single-pronged implements with a coultter body are shown in a one-horse harness without a yoke with a yoke. The ploughshare, which the plowman is holding, is clearly visible; iron tips are not highlighted in both pictures. On a miniature from a synod book of the 40s-60s of the 17th century. withered narrow, slightly curved in the longitudinal plane, resembling a tooth in shape

(Fig. 91, 1). This gives reason to see in the tool depicted here, most likely, a "draftsman". In the miniature from the Apocalypse, the tiller is wide in the upper part, massive, strongly bent forward, so that the working part of it enters the soil in a position close to horizontal. According to A.D. Gorsky, a single-toothed roe deer could be depicted here [Gorsky A.D., 1965, p. 30, 31]. While not excluding this possibility, it is still necessary to note the absence of other distinguishing features of a roe deer in the drawing: incisor, wide blade, etc., so unambiguous interpretation of this image is difficult.

Information from written sources and iconography are extremely important for our topic. They indicate that already in the XIII century. *soha* was known in a significant part of its range, as evidenced by ethnography. For the period of the XIV-XV centuries. there are sufficient reasons to consider the plow as the most common, dominant plowing tool in these areas. No later than the 14th century. written sources record the tradition of considering coulter in pairs, which may indicate the characteristic two-prongedness of the instrument in question. Written and iconographic sources of the XVI-XVII centuries. show that plows of that time practically did not differ in the structure of the body from two-toothed plows according to ethnographic data. In the 16th century plowshares with shelves were known, and not only translational plows, but also single-sided plowshares, in particular their most developed forms - plowshares with "cutters", prototypes of the later roe deer.

As in the recent past, plows were often used together with special tools designed for cutting turf and hard ground - cutters or plotters.

To trace the earlier periods of the history of the *sokha* and to specify our ideas about the *sokha* of the XIII-XV centuries. archeological sources allow us to consider them.

Archaeological data on plows are represented by finds of coulters, iron parts of shelves and two-toothed plowshares from pre-revolutionary excavations in Old Ladoga, now, unfortunately, lost. Of particular importance for our topic

are the finds of coulter, in most cases more or less accurately dated. Their study makes it possible to trace the chronological and territorial distribution of plows and, on this basis, to outline the area of their occurrence, can serve as a basis for the reconstruction of ancient plows, makes it possible to outline the evolution of plows and explain their causes.

As already mentioned, of all the iron tips of plowing tools known in the Eastern European archaeological material, only the tips of group III, according to the classification adopted by us, should be classified as coulter (see Fig. 11 - 13, 93, 1, 3). The oldest finds of openers come from Staraya Ladoga. One of them was found in

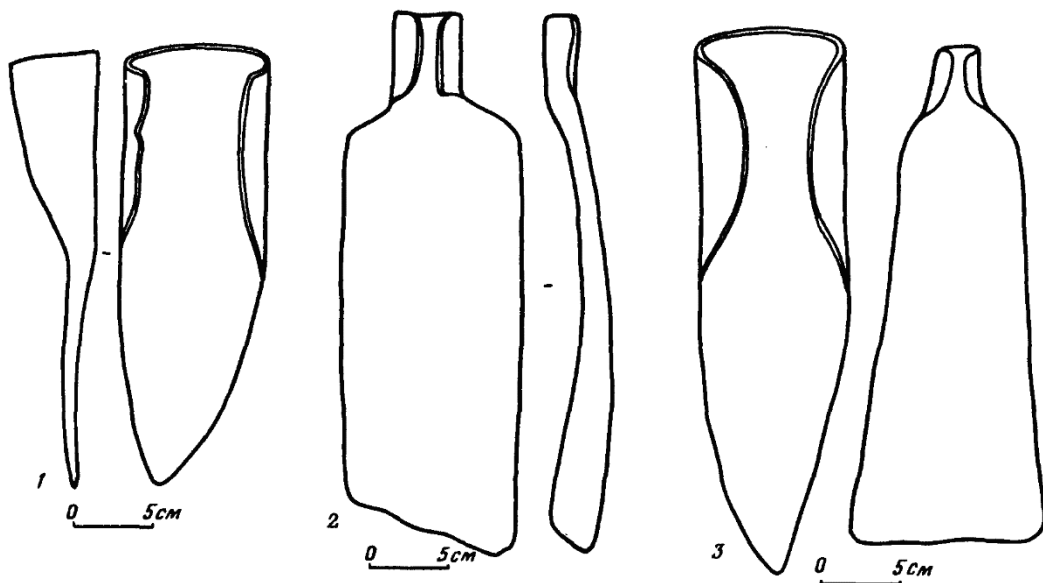


Fig. 93. Coulters (1, 3) and a shelf (2) from an accidental find in the former Kolomensky District

E3 horizon and should be dated to the middle of the VIII-first quarter of the IX centuries, the other - in the lower layers of the D horizon [Myrolyubov M.A., 1972, p. 120, 121, fig. 3, 4], which belong to the end of the 9th-beginning of the 10th century. [O. I. Davydan, 1976, p. 100-118]. They are not younger than the

oldest Old Ladoga coulters, discovered in the hoard of Kholopii, a town near Novgorod, in a hoard of agricultural tools from the end of the 8th to the beginning of the 9th century. [Nosov E.Ya., 1982]. Apparently, sometimes no later than the 10th century. it is also necessary to date the already mentioned rossokha from a two-toothed plow from the old excavations in Staraya Ladoza [Ravdonikas V.Ya., 1950, p. 48; Orlov S.Ya., 1954, p. 344, 349]. Given the lack of convincing ethnographic data that plows could be used without iron tips, it can be assumed that the time of appearance of the plow should be close to the date of the earliest plows.

Archaeological finds of the tips in question show the gradual expansion of the area of the plow (Fig. 94). X or, rather, XI century. the earliest finds of coulters in Novgorod are dated [A.V. Artsikhovskiy, 1955, p. 67, 68; Kiryanov A.V., 1959, p. 345]. Fragment of a coulter from the Tymyrev burial mound [Yaroslavl Region... 1963, p. 32] and a whole coulter from the mound in the village. Velika Brembola in the current Yaroslavl region. [A.S. Uvarov, 1892, tab. XXIX, 14; V. Ya. Levashova, 1956, p. 32, fig. 5, 4] testify that in the X-XI centuries. plow also appeared in the Upper Volga region. The range of plowshares appears to be even wider according to finds of plowshares at the monuments of the XI-XII centuries. Besides Novgorod [A. V. Kiryanov, 1959, p. 348], coulters of this time are known in the mounds of Griladozha [S.Ya. Kochkurkina, 1973, p. 70], from Pskov [Grozdilov G.Ya.. 1962, fig. 46, 10], Minsk [E.M. Zahorulskiy, 1965, p. 153; T. Ya. Korobushkina, 1967, fig. 1, 1-2), Grodno, Orshi, Volkovyska [T.Ya. Korobushkina, 1979, fig. 3, 1, 4, 8; 5)3, from mounds in col. Volodymyrska [A.S. Uvarov, 1872, p. 116, 149] and Mogilivskaya [Y.A. Muromtsev, 1871, p. 155] provinces, from the settlement of Vshchizh in the Bryansk region. [V.P. Levashova, 1956, p. 32, fig. 5, 3], as well as on the sights of Latvia [Alekseev L.V., 1966, fig. 19, 2; Moore X., Leagues X., 1969, p. 7].

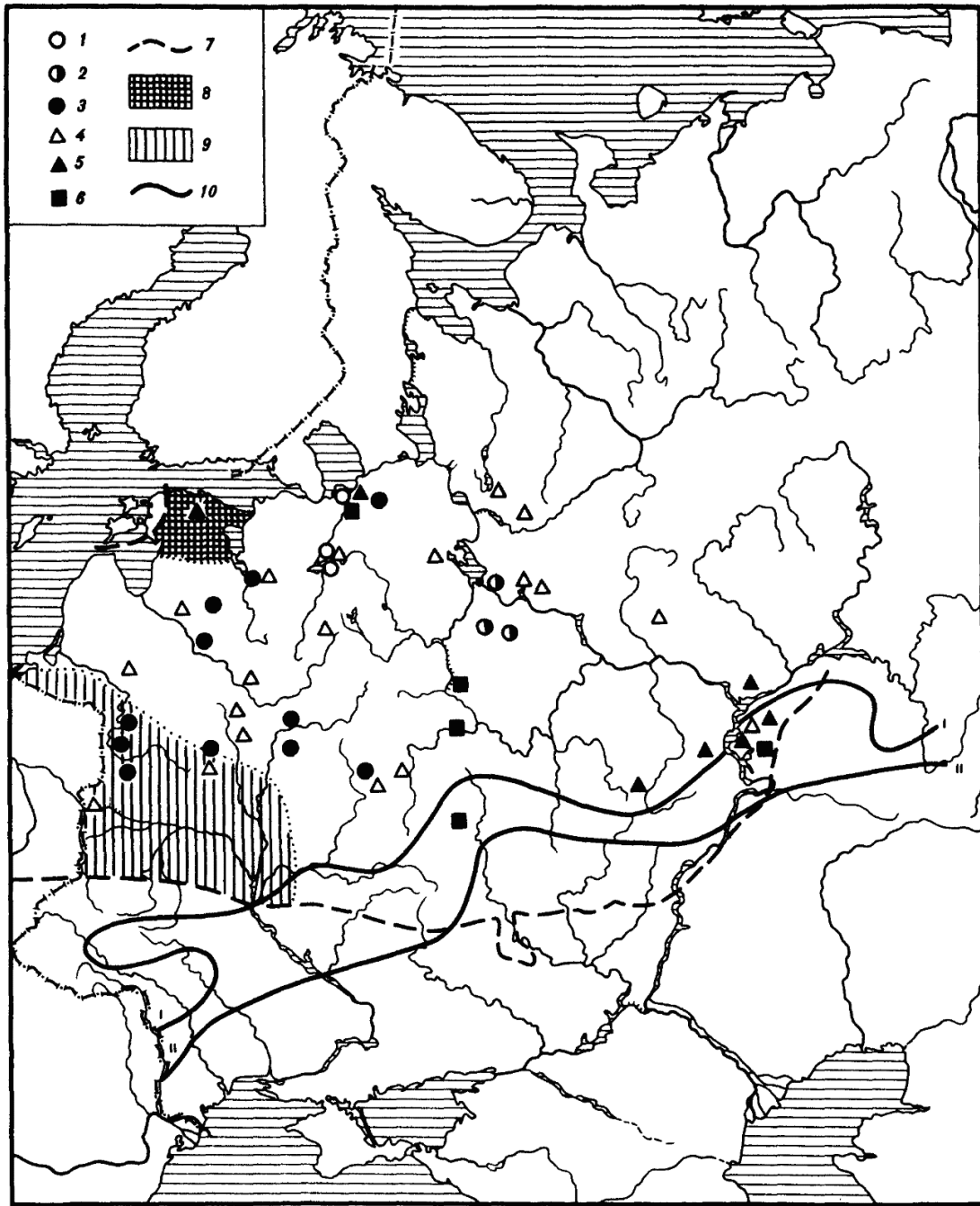


Fig. 94. Distribution of the plow:

1- coulters of the end of the 8th and 10th centuries; 2 - coulters of X-XI centuries.; 3 - openers of the XI-XII centuries.; 4 - coulters of the XI-XIII centuries; 5 - coulters and shelves of the XIII-XIV centuries; 6 - coulters and shelves of the XV-XVII centuries; 7 - southern and western borders of the main area of the plow; 8 - the range of Estonian sohs with "cranes"; 9 - the area of "Lithuanian" or "Polish" soha; 10 - boundaries of natural zones: I - southern border of the forest zone; II – the southern border of the forest-steppe

Finds of coulter widely dated to the period of the XI-XIII centuries, as well as the XII-XIII centuries, are known from Novgorod [A.V. Kiryanov, 1959, c. 347-349; V. Ya. Levashova, 1956, p. 31, 35; V.V. Sedov, 1956, fig. 43, 7. See also col. Novgorod Museum and State Historical Museum, Pskov; S.A. Tarakanova, 1953, p. 213; V. Ya. Levashova, 1956, p. 31], Toroptsia [Malevskaya M.V., 1963], a number of points on the territory of Belarus [Korobushkina T.Ya., 1979, p. 26-34], at the sights of Vologda, Kostroma, and Yaroslavl [V.Ya. Levashova, 1956, p. 31, fig. 5a, 1; Nikityn O.Ya., 1974], Volodymyrska [Sedova M.Ya., 1978, tab. XIII, 4, 5. Cm. also col. Volodymyr Museum and State Historical Museum from Pirova Horodyshche], Smolensk [Y.V. Syedov, 1957, p. 94, 303-304; 1960, fig. 24, 3], Bryanska [K.V. Pavlova, P.A. Rappoport, 1970, p. 72], Kaluzka [Nikolskaya T.Ya., 1981, fig. 90, 8, 9], Ryazan [Mongait A.L., 1961, p. 259] regions, in the former Yaran district [V.Ya. Levashova, 1956, p. 31], as well as in Latvia [Shnore E.D., 1961, p. 91] and Estonia [Myrolyubov M.A., 1980, p. 7]. No later than the end of the 12th - the beginning of the 13th century. Ploughshares spread to the territory of Volga Bulgaria, as evidenced by finds of plowshares in the Semeniv village in Tataria, dated to this time. The accidental find of a coultter near the village can typologically be attributed to the same period. Pekoza in Mariysk ASSR [Archypov G.A., 1973, p. 72, fig. 76]. About the use of the plow in the 13th-14th centuries. On the territory of present-day Mordovia, the findings of a coultter at the Panzhynskoye settlement and a coultter shelf during the excavations of the Starosoten burial ground in the Narovchatsky district testify [Levashova V.P., 1956, p. 32, 37]. Most of the coulter from the territory of Volga Bulgaria should probably be dated to the time of the Golden Horde, i.e. XIII - XIV centuries. Colanders from the Belgorod fortress [A.V. Nikitin, 1962, fig. 6, 1] testify to the spread of the plow in the XV-XVII centuries up to the forest-steppe.

The given summary of the most important finds of plowshares allows us

to come to the conclusion that the plow as a special plowing tool was formed no later than the end of the 1st millennium AD. e. in the northwest of the European part of the former USSR. From here, plows gradually spread to the west, south and east, to other areas of the forest zone, reaching by the 16th century. its southern borders and even crossing them. However, during this period the area of plowing was still narrower than that outlined by ethnographic data, and was more clearly connected with the areas of distribution of coniferous and mixed forests with their specific soils. Obviously, the spread of plowing to the south and east continued even later (Fig. 95).

An important question is the ethnic environment in which this new plowing tool arose.

The ethnic composition of the Staroladoz settlement of the 8th-10th centuries, on which some of the earliest evidence of the existence of a plow was found, was very complex, the reasons for which should be sought in its very nature as an important trade and craft point on the Volkhov Road. Finnish, Hungarian, Baltic, Scandinavian elements are clearly visible here. At the same time, from the very beginning, the settlement certainly had a Slavic component, the role of which is growing over time. The appearance of Old Ladoga ceramics makes it possible to bring them closer to the similar material of the Slavic monuments of the Northwest [Bulkin V.A., Dubov I.V., Lebedev G.S., 1978, p. 87]. The ethnocultural interpretation of the "big houses" that V.I. Ravdonikas considered Slavic [Ravdonikas VI, 1950]. All researchers recognize the Slavic affiliation of the square houses of log construction with a stove in the corner, which are already known in layer E and become dominant in horizon D.

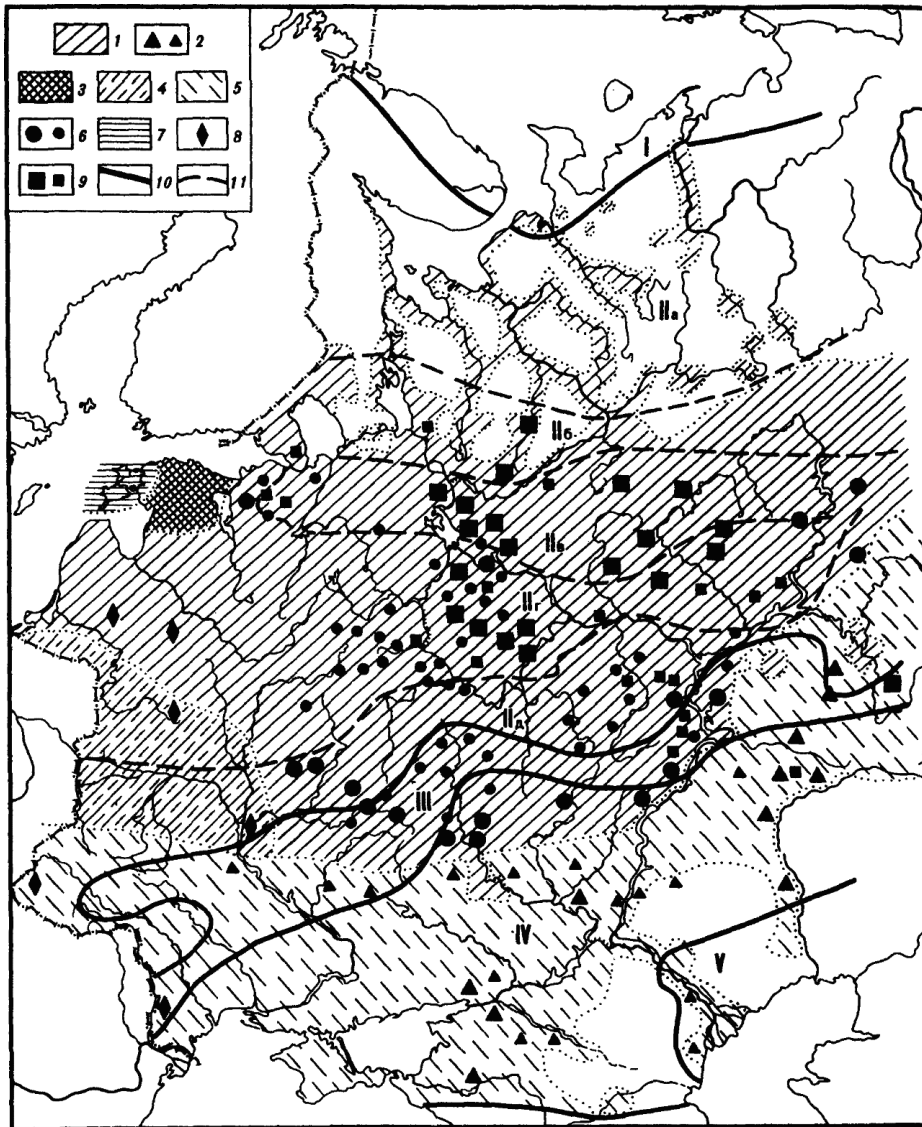


Fig. 95. The spread of plowing tools in Eastern Europe until the middle of the 19th century:

1- the main area of plowing; 2 - soha outside its main range; 3 - the range of Estonian sohs with "cranes"; 4 - the area of "Lithuanian" or "Polish" plow; 5 - the main range of plows and plows; 6 - plows and plows outside their main range; 7 - the area of the plow as the main plowing tool; 8 - places where the plow is used as the main plowing tool when other tools dominate; 9 roe deer; 10 - boundaries of natural zones; 11 - border of subzones in the forest zone; And - tundra; IIa - northern taiga; 11b - middle taiga; IIc - southern taiga; IIg - subzone of mixed forests; IIh - subzone of broad-leaved forests; III - forest-steppe; IV - steppe; V - semi-desert

Construction of the settlement in the 9th-early 10th centuries. acquires a regular street character, typical of an ancient city. This and a number of other circumstances make it possible to assume that the Slavic element began to dominate in Old Ladoga, probably, already at the end of the 9th century. [Bulkin V.A., Dubov I.V., Lebedev G.S., 1978, p. 90]. The Slavic settlement was Kholopii, a small town where coulter were found, which are not inferior in antiquity to those of Old Ladoga. Novgorod, where there is also quite early evidence of the use of the plough, arose, presumably, during the creation of a federation of two Slavic (Slavs and Krivich) and one of the "Chudsky", i.e. Finno-Hungarian, tribes with the leading role of the former [Yanin V .L., Aleshkovsky M.X., 1971, p. 32-61; Yanin V. L., 1977, p. 219, 220]. The mentioned monuments of the Yaroslavl Volga Region, where openers were found, characterize the mixing of Slavs with the local Finno-Ugric population [Horyunova E.I., 1961, p. 194 - 198]. It is important to note that in the IX-X centuries. the source territory for this process in the Upper Volga, according to most researchers, was the northwestern region [I.V. Dubov, E.A. Ryabinyn, 1972, p. 57-65].

Thus, the oldest evidence of the use of the plow refers to the areas where there was a mixed population with the inevitable presence of the main Slavic element. This circumstance, as well as the fact that the later archaeological sites where coulter were found, were mostly left by the ancient population, gives reason to consider the plow as an element of Eastern Slavic agricultural culture, which arose in the specific conditions of northern forest farming.

Apparently, it was from the Slavs that the plow penetrated to other peoples. Based on the available archaeological data, the ploughshare began to be used in the Baltics no later than the 12th-13th centuries, at first, probably in Latvia, and later in Estonia. The coulter, close to the oldest Old Ladoga ones, date back to the XI century in the south of Finland. [Kivikoski E, 1951, p. 26, 27, tab. I, 22]. This is quite understandable given the active ties of the Old

Ladonian population with the West. In the process of intensive contacts with the Slavs, the sokha already penetrated to the Finno-Hungarian peoples of the north and to the non-Slavic peoples of the Middle Volga region in pre-Mongol times. Linguistic information about the names of plowshares among non-Slavic peoples fully corresponds to the ideas about its distribution that emerge from archeology data.

Everywhere in the distribution zone, plows preceded it, and in part were synchronous with other types of plowing tools. Type IA2 naralniks from Staraya Ladoga and Novgorod are older than the coulter found here. Rala with similar naralniki in the X-XII centuries used on the Upper Volga and in Beloozer. Images of a ploughshare on a load from the Troitsky settlement in the suburbs of Moscow and finds of a nearby tool in a peat bog near the village belong to a much earlier time than the period of the spread of the plough. Kaplanovichi in the Minsk region. Some of the coulters from the monuments of Belarus are older than the coulters found here, some are contemporaneous with them. The ploughland from Brest belongs to the period of widespread plowing. In the Middle Volga Region, the plowshares from the Azelinsky burial ground, the Osh-Pando hillfort, and the Imenki monuments are much older than the plowshares. In the period when plowing began to spread in Volga Bulgaria, not only ploughs, but also plows were used here. Plow also preceded plowing in the Baltic region.

Thus, archaeological evidence does not allow us to consider the plow as the oldest type of plowing tool in the forest zone. It arose at a certain stage of the development of arable agriculture here and continued to spread in areas where arable agriculture already existed, partly displacing the plowing tools that existed before, partly using them alongside them. Judging by the number of archaeological finds of coulters and tips of other plowing tools, plows were already in the XI-XIII centuries dominated most of the forest zone, with the exception of its eastern areas and southern outskirts.

Let's turn to the complex issues of reconstruction of early sokhs. First of all, we should note that the archaeological data do not allow us to distinguish among the iron tips of plowing tools any transitional forms from plowshares to plowshares. Even the earliest coulter (see Fig. 11, 1) clearly differ in shape and proportions from coulters in general and each of their specific types. There are great differences between the oldest plowshares, on the one hand, and partially synchronous plowshares, found in the supposed area of the plow (type IA2), on the other. This makes it possible to think that the oldest plows differed significantly in their structure from the plows used in the same area.

The dimensions of plowshares from archaeological finds up to the 16th century, as well as a number of features of their shape, do not allow us to see in the tools equipped with them plowshares of the type known in ethnography Lithuanian or Polish, as well as Estonian plowshares with "cranes" and a long shaft, iron tips which were very large. We find confirmation of this in the description of the rossokha of the 10th century. From Staraya Ladoga, which fully corresponds in size and structure to the sokha. Ethnographic data, which we paid attention to, indicate that Lithuanian plows and Estonian plows with "cranes" are historically later forms than plows. In this regard, the opinions expressed by some authors about the formation of the North Estonian plow with long "cranes" no later than the 11th century [Vilkuna K., 1971, p. 98], and Lithuanian or Polish - even earlier [Dundulene P., 1968, p. 20], in our opinion, cannot be confirmed by available sources.

As for plows of the so-called North Estonian type with long "cranes" and a short shaft, as well as Karelian plows with a shaft, theoretically they could be equipped with such plows, which are known in the archaeological material. A.V. Chernetsov is even inclined to consider plows without a plowshare, with a shaft, in the rear end of which a rossoha was inserted, as typologically the oldest variety, transitional from the plow to the plow [Chernetsov A.V., 19726, p. 396 - 397, tab. 1; 1975, p. 78 - 79, tab. 1, 9, 14, 15, 20]. However, we do not have

any information on how ancient such tools were, and this is the conclusion of A.V. Chernetsova is based exclusively on typological constructions, which in this case seem insufficient. With no less reason, such tools can be considered as a relatively late contamination of the plow and plowshare of a certain type. This is how H. Ryank considered North Estonian plows with long "cranes" and a short raso, attributing their origin to the 19th century. [Rank G., 1955, p. 20]. In this connection, it should be noted that the old Ladoz rossokha, judging by its width, was adapted for connection with the rogal, not with the shaft.

It has already been noted that the iconographic material of the XVI-XVII centuries. Testifies exclusively to the one-horse team of sokhs, and the data of written sources make it possible to extend it at least to the XIII century. However, the use of a horse to drive plowing tools dates back to a much earlier time in Eastern Europe. According to V.I. Tsalkin, this fact is confirmed by the composition of osteological material from the monuments of the Chernyakhiv culture at the end of the first half of the 1st millennium AD. e. [V.I. Tsalkin, 1966, p. 81, 97]. The oldest data from written sources about plowing among the Eastern European Slavs mention both an ox and a horse. The collar, the most important accessory of a horse-drawn carriage, according to archaeological data, became known in Eastern Europe no later than the 10th century. [Kolchyn B.A., 1968, p. 56]. "Russkaya Pravda" talks about the horse as the main work animal of stench and purchase [Pravda Russkaya, 1940, p. 399, 420, 421, 428, 429]. In the speeches of Volodymyr Monomakh of the beginning of the 12th century, recorded in the annals, it is about a stench who plowed on one horse (PSRL, vol. I, p. 227; vol. II, p. 252-253, 264-265).

All these data make it highly probable that the one-horse team could have been characteristic of the plow from the very beginning of its existence. Apparently, it was the adaptation of the plow tool for the one-horse team that played a significant role in the formation of the characteristic method of connecting the main parts of the plow with the help of a rogal. Ethnographic

data on the use of plows with a shaft only on the outskirts of the plow area, where the latter was adjacent to the plow, also confirm this assumption. But then it seems superfluous to derive the plow from a plowing tool with a shaft and a two-toothed working part, although specific data are not yet sufficient for a final solution to the issue.

Many authors who touched on the early history of the plow considered the oldest plowshares, characterized by relatively small sizes and symmetry of the blade, as belonging to multi-toothed tools [see, e.g. Ravdonikas V.I., 1950, p. 39; V. Ya. Levashova, 1956, p. 28, 35; Kiryanov A.V., 1959, p. 314-320; 344-350]. M.P. Myrolyubov, on the contrary, made the assumption that they were equipped with single-tooth tools [Myrolyubov M.A., 1972, p. 121; 1980, p. 7]. V.Y. Dovzhenok also did not rule out the possibility of assigning a part of symmetrical openers to single-tooth tools, without specifying this position [V.Y. Dovzhenok, 1961, p. 83-89]. At the same time, A. V. Chernetsov [A. V. Chernetsov, 1972, p. 142-143] and a number of other researchers, see, e.g., Korobushkina T.Ya., 1979, p. 25-26th, all openers, in particular small and symmetrical ones, are considered to be accessories of two-toothed tools.

It is difficult to verify the validity of these assumptions. Proponents of classifying small symmetrical openers as multi-toothed tools were based primarily on the hypothesis of P.M. Tretyakov about the "primitiveness" of multi-tooth saws, which seems very doubtful. It was noted, in addition, that only asymmetric coulters can correspond to two-tooth tools. But the last position is not confirmed by acquaintance with the tips of double-toothed plowshares from ethnographic materials: symmetrical ones are often found among circular plowshares of such tools. The asymmetry of the coulter blade of two-tooth tools is technically necessary only when their iron tips are installed at a small angle to the soil [Schindler K., 1980, vol. I, p. 54]. The "cherkavych" have tools with a plow in a position close to vertical (these are typologically the simplest plows according to ethnography - "tsapulka", two-toothed "cherkushes", "palvi"

plows), whose plowshares do not cut the ground from below, but only they tear, "grab" or "draw" it from above, the symmetry of the coulter does not complicate their work. The early plows had, obviously, just such a drying setup. This is evidenced, in particular, by the iconographic material, as well as the fact that many coulters of the 11th-13th centuries. had the front side erased [Moora X., Leagues X., 1964, p. 81]. This could only happen if the coulters were directed almost vertically to the ground during operation.

Without denying the theoretical possibility of equipping single-toothed tools with coulters of the early Old Ladoga type (i.e., symmetrical with a blade narrower than the sleeve), we note, however, that the tips of single-toothed plowshares known from ethnographic data had a completely different shape.

There are three important arguments in favor of the fact that all coulters from archaeological materials should with the greatest degree of probability be classified as double-toothed plowshares. This is, first of all, the fact that the only archaeological find of a part of the plow body - a ploughshare from Stara Ladoga, synchronous with the oldest ploughshares - had the usual two-toothed shape for a ploughshare. Secondly, these are ethnographic and medieval iconographic sources, which do not give grounds to talk about any wide distribution of multi-toothed and single-toothed saws, nor about their significant antiquity. Thirdly, it is a tradition of written sources to consider coulters in pairs, which goes back at least to the 14th century. It should be noted that the symmetrical tips of group III, in particular the small ones, can be compared in terms of their proportions with the iron tips of two-toothed saws from ethnographic materials. In other words, we do not have any real data at our disposal that prevents the interpretation of even the earliest coulters as tips of two-pronged tools.

Thus, despite the paucity and heterogeneity of the available sources, there are reasons to reconstruct the oldest plows as two-pronged tools, similar in structure and method of harnessing to plows known from iconographic data of

the XVI-XVII centuries and ethnographic materials.

If we accept such a reconstruction, then the emergence of the plow should be considered, most likely, as a one-time invention, and not to deduce its structure from the *rał* through a series of transitional forms, which are restored only on the basis of ethnographic parallels from different territories at different times. This does not mean, of course, that the plowshares that were used in the area where the plow appeared and that preceded it in time did not have a certain influence on the structure of the new plowing tool. As already mentioned, such plows, equipped with iron tips of type IA2, can be reconstructed as tools with a high position of the place of application of the traction force and an almost vertical installation of the working part. Both of these features were also characteristic of plows and, quite possibly, passed to the new tool from the plows that preceded plows. We will remind that among the folk names of iron plow tips there is also the term "naralniki", which may indicate a certain connection between the plow and the plow. It is interesting that plows with tips of type IA2, which were used in the north-west of the European part of our country before the appearance of the plow here and partially synchronous with it, had very wide plowshares: the width of the sleeve of their tips reached 9-10 cm. The width of the sleeve of the VIII-X coulter Art. is 5-7 cm, that is, almost half as much. This suggests that the emergence of the plow was connected with the splitting of the working part of the plow tool, and not with its doubling, as D.K. assumed. Zelenin [Zelenin D., 1907, p. 122]. In the plan of comparison of type IA2 plowshares and the oldest plowshares, it should be noted the partial coincidence of their absolute dimensions (total length, sleeve length), as well as the fact that some early plowshares had, like plowshares, an oval cross-section of the sleeve.

In view of what has been said, as well as the much later appearance of the plow compared to the plow, it is quite possible to assume that the plow originated on the basis of a certain type of plow - with a high location of the

place of application of the traction force and an almost vertically installed plow. However, the technical embodiment of the principle of the structure of this new tool turned out to be completely different.

Finds of the oldest openers are not accompanied by finds of shelves. Obviously, the early plows did not have this adaptation and belonged to such varieties that are close to the ethnographic "tsapulka", "Cherkusha", "palovy plows". Archaeological finds make it possible to say that iron shelves in the shape of a shovel were used already in the XIII-XIV centuries. (see Fig. 93, 2). Shelves from the Starosoten cemetery date from this time [Levashova V.P., 1956, p. 32, 37], Vetskajoka settlement in Latvia [Shnore E. D., 1961, p. 91], a fragment of a shelf from Staraya Ladoga [M. A. Myrolyubov, 1980, p. 9], a little later - shelves from accidental finds in the former Kolomensky district [Levashova V.Ya., 1956, p. 35, fig. 8, 1-2], near the village Shamoky in the Vetluz district of the Gorky region. [G. A. Arkhipov, 1973, p. 71, fig. 76, 1], as well as on the territory of Volga Bulgaria. However, there is no reason to completely exclude the possibility of using entirely wooden shelves, so the exact time of appearance of this device is difficult to determine. Until the XIV century. shelves were already used in the entire range of plow use.

It is also difficult to solve the question of the prototype on the basis of which the shelf could have been formed. From a functional point of view, plow shelves, and especially additional ploughshares with iron tips, could serve as a prototype of a plow shelf, but from a constructive point of view, there are huge differences between them. Apparently, the appearance of the plow shelf should also be considered as a completely independent design solution of the device for dumping the earth to one side, adapted to such a specific plowing tool as the plow.

As we were able to see, openers from the archaeological material are divided into five genetically related types that appeared at different times. The oldest type are type IIIA1 tips with a symmetrical blade narrower than the

sleeve. Being represented in early Old Ladoga and Upper Volga finds, they existed until the 14th century, and possibly even later, spreading throughout the area of the sokha. Tips of type IIIA1 do not have direct analogies in the ethnographic material, but in terms of their proportions, they are quite comparable to the tips of "ethnographic" two-toothed axes (Fig. 96). The absolute dimensions of these latter and tips of type IIIA1 partially coincide: ancient tips are generally smaller than "ethnographic" ones, which is typical for other types of plowing tools. It should be noted that in the descriptions of harrows of the 18th century, which had an almost vertically placed rake and worked on forest or rocky soil, the narrowness of the harrows, sometimes even their awl-like shape, was repeatedly emphasized [see, e.g.: Proceedings of the Free Economic Society, 1769, part 13, p. 16-17; Zelenin L., 1907, p. 31, 158; etc.], which is typical for tips of the considered type.

Close to each other are generally larger and more massive tips of types IIIB1 and IIIB2 (see Fig. 12), which arose later than type IIIA1 and are characterized by the fact that their blade has the same width as the sleeve for most of its length, and narrows only to front end, which is always rounded or blunt. In terms of shape, size and proportions, they find complete analogies among the coulter blades of two-toothed code plows from ethnographic materials [Zelenin D., 1907, p. 32], which had both an asymmetric and less often a symmetric blade (Fig. 97). Plows with circular coulters could have a different setting of drying, it is used both with and without police on different types of soils, especially often on stony ones.

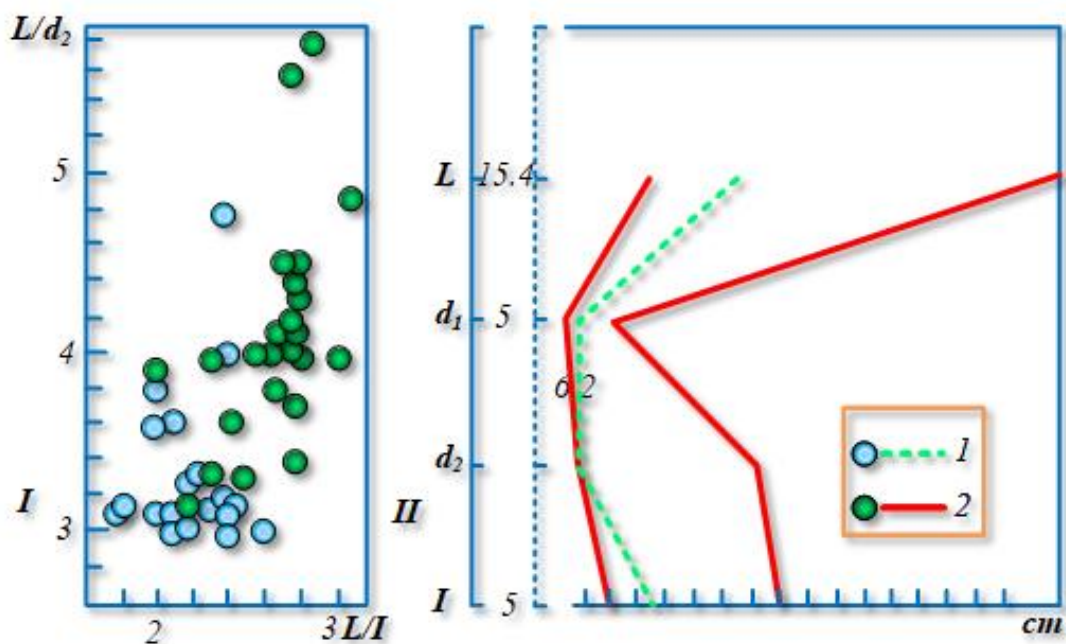


Fig. 96. Coulters from archaeological and ethnographic materials:
 I- type IIIB1; 2 - from ethnographic materials; And - correlation of the ratio of
 the total length to the greatest width; II - comparison of absolute sizes

Also close to each other are coulters with a blade wider than the sleeve (types IIIB1 and IIIB2), which appeared no later than the 12th century. Tips of type IIIB2 (see fig. 13, 3, 4), especially their late copies, in terms of shape, size and proportions are well compared with feather coulters of "ethnographic" two-toothed saws (fig. 98). According to D.K. Zelenina, "the differences between these plowshares and the "wheel plowshares" are their comparative width (in the upper part) and partly the sharpness of their field edging... the sharpness is also only relative, because the plow does not know absolutely sharp plowshares at all" [Zelenin D., 1907, with. 33]. However, the "ethnographic" first openers tend to have a wider feather than the "archaeological" ones, which mean obviously, only the initial stage of the formation of this variety of tips of axes. Plows with feather coulters, according to ethnographic data, had a less steep plowing setting than wheel plows, were usually equipped with a shelf, and were used mainly for the cultivation of old arable soils. They were convenient for plowing manure,

which was necessary under the steam farming system. Tips of type IIIB1 (see fig. 13, 1, 2) should be considered as a transitional form from circular openers to feather ones: their blade has become wider than the sleeve, but its characteristic asymmetrical shape has not yet developed. Such coulter also find parallels in ethnographic material (Fig. 99).

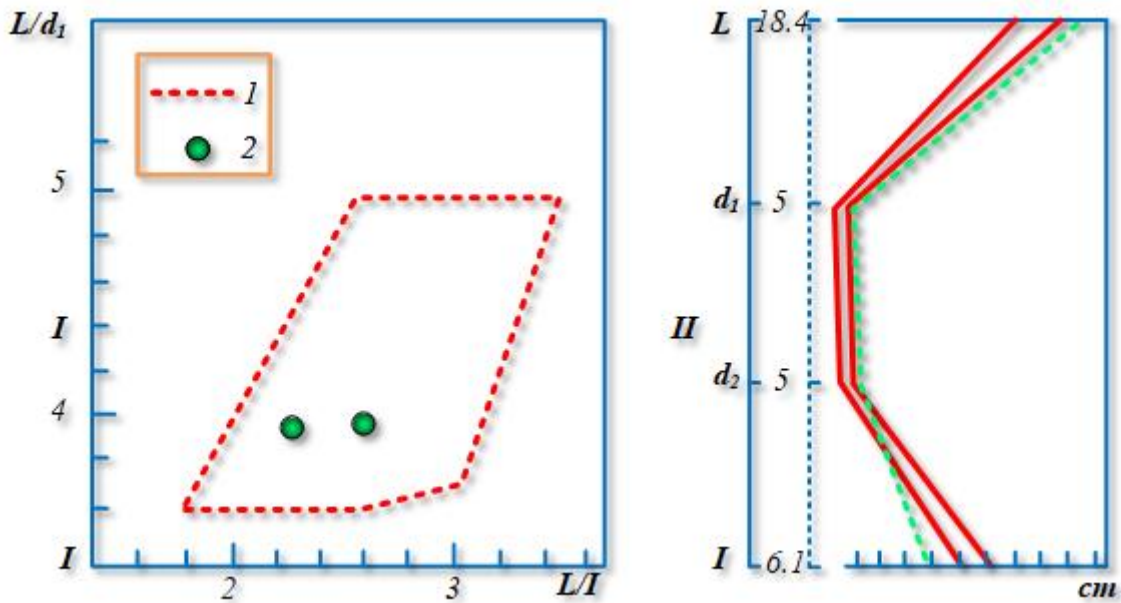


Fig. 97. Coulters from archaeological and ethnographic materials

I- types IIIB1 and IIIB2; 2 circular coulter with a blade equal to the width of the sleeve, from ethnographic materials; *I* - by correlation of the ratio of the total length to the average width of the sleeve and the total length to the length of the sleeve; *II* - comparison of absolute dimensions

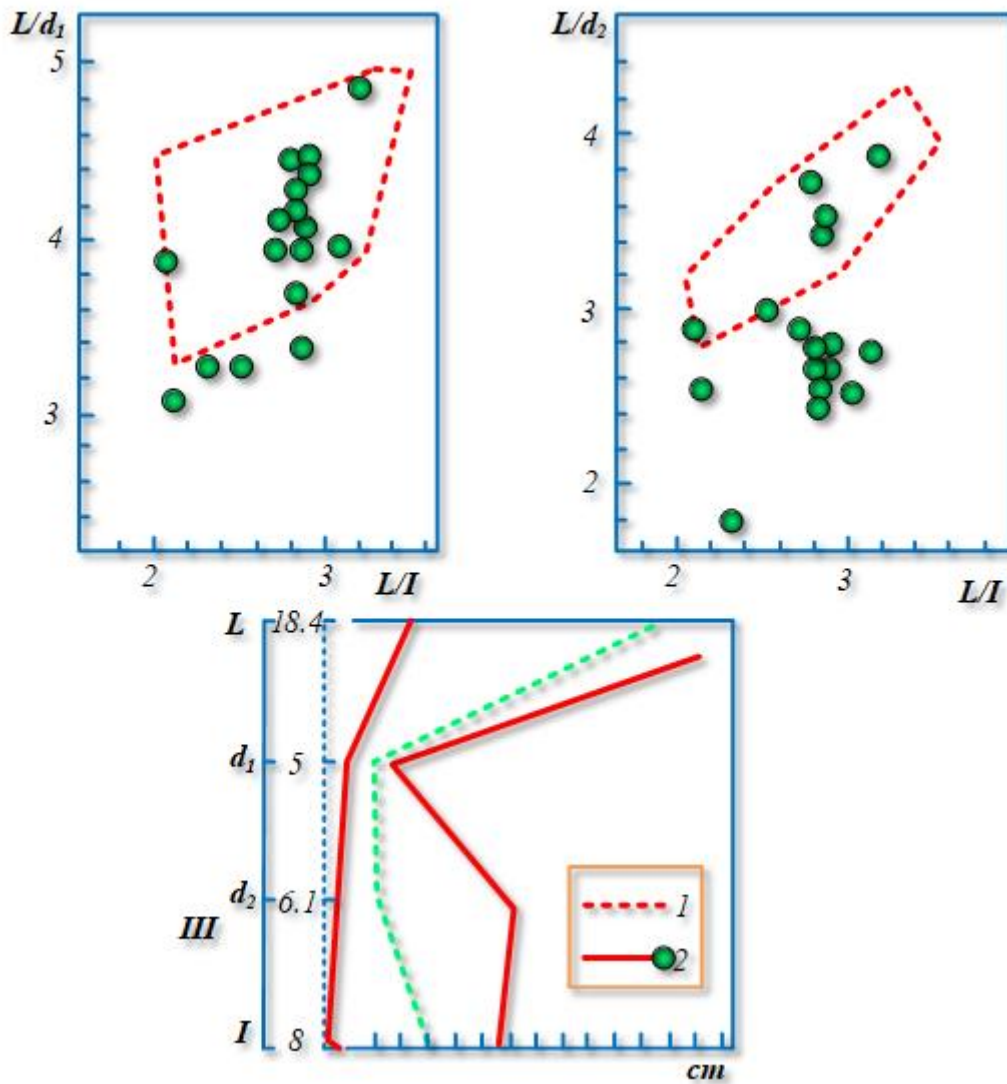


Fig. 98. Coulters from archaeological and ethnographic materials

1- type IIIB2; 2 - feather coulters from ethnographic materials; And - correlation of the ratio of the total length to the average width of the sleeve and the total length to the length of the sleeve; II - correlation of the ratio of the total length to the largest blade width and the total length to the sleeve length; III - comparison of absolute dimensions

Both considered types of openers are archaeologically recorded mainly in the central and southern areas of the forest zone. Obviously, it is here where the process of formation of massifs of old arable land proceeded at a faster pace,

and the area of their assembly should be sought. It is possible that since the appearance of coulters with a blade that was wider than the sleeve, adapted primarily for the cultivation of old arable land, a transfer shelf appeared, at first, probably entirely wooden.

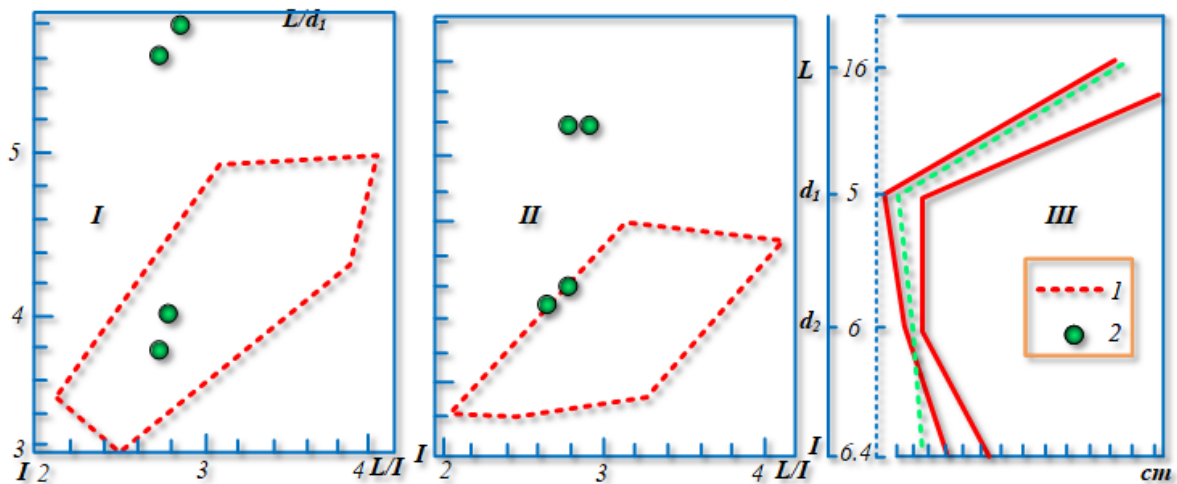


Fig. 99. Coulters from archaeological and ethnographic materials: 1- type IIIB1; 2 - circular coulters with a blade wider than the sleeve, from ethnographic materials; I - correlation of the ratio of the total length to the average width of the sleeve and the total length to the length of the sleeve; II - correlation of the ratio of the total length to the largest blade width and the total length to the sleeve length; III - comparison of absolute dimensions

Thus, the evolution of the coulters known from archaeological materials went from narrow tips designed to be fixed on an almost vertical spread and best suited for surface cultivation of lands that had recently been removed from the forest, to strong and large coda coulters adapted for deeper plowing of various, primarily heavy and stony soils, and further - to feather coulters, which were installed at a smaller angle to the soil and used mainly for work on cultivated old arable lands. The emergence of a shelf, initially, of course, a translation one, may be connected with the appearance of early forms of feather coulters. The evolution of ploughshares obviously reflects the gradual expansion and

cultivation of arable land in the forest zone, connected with the general development of arable agriculture.

The absolute dimensions of "archaeological" and "ethnographic" coulter, as already noted, coincide only partially: the latter are generally somewhat larger than the former (Fig. 100). It is unlikely that this indicates the same differences in the size of the tools themselves. Ethnographic data show that the size of plows was determined primarily by the height of the plowman. Presumably, the differences in the sizes of the coulter indicate the economy of iron rather than the significant differences in the sizes of the coulter of antiquity and the recent past. Even the difference in the width of the sleeve, which characterizes the width of the teeth of the plow, cannot contradict this: the wooden teeth of the plow are always somewhat narrowed downwards, so a shorter tip should have a narrower sleeve. As for the very significant differences in the width of the blade, they are explained by the fact that among the "ethnographic" coulter, feather ones prevailed, and among the "archaeological" - circular or similar forms.

Thus, the sokha was formed, obviously, much later than the ral, at the end of the 1st millennium AD. e., in the northwestern regions of the European part of our country, in the East Slavic environment, in the conditions of the arable agriculture already existing here. From here it gradually spread to other areas of the forest zone, becoming the main and most important plowing tool not only of s, but also of other peoples in most of this territory.

In practically all areas of its range, the plow was not the first and oldest plowing tool. From this point of view, the thesis that it was formed on the basis of any modern agricultural tools seems extremely doubtful.

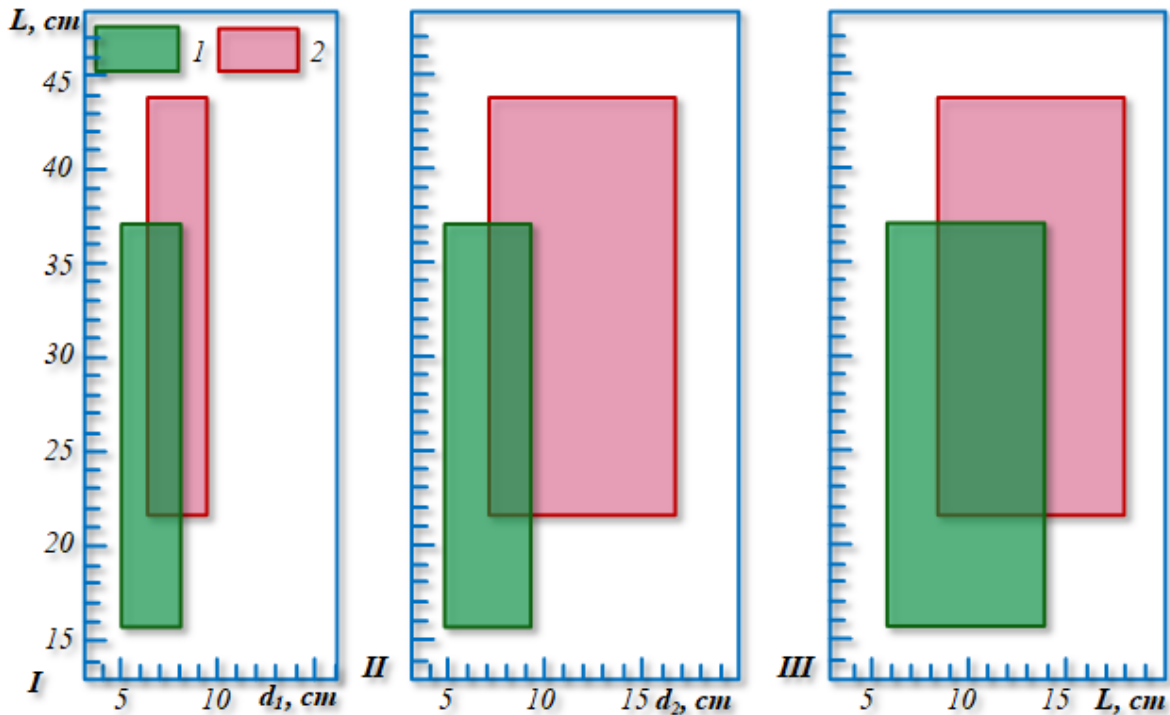


Fig. 100. The extreme limits of the absolute dimensions of coulters made of materials:

I- archaeological; *2* - ethnographic

According to the peculiarities of the structure of the case, the earliest plows belonged, most likely, to that type of two-pronged tools, which in the ethnographic literature received the name of or Great plows. It is quite likely that the one-horse team with short plows and without an arc was the oldest for the plow and in many respects determined the main features of the structure of its body. Early plows were probably characterized by lightness, an almost vertical installation of a single plowshare and iron tips, as a result of which - great turning power, but small plowing. The peculiarity of the plow body, its most significant differences from the body of plows and plows may indicate the relative independence of the emergence of the plow, which should be considered as a one-time invention. At the same time, one cannot ignore certain features of similarity in the functional relationship between plows with a high place of application of traction force and a close to vertical position of the plow, on the

one hand, and the oldest plows - on the other. In this sense, and only in this sense, we can talk about the origin of the plow from the plow.

At first, the plow appeared, obviously, as a plowing tool for work only in the conditions of forest fallow and the transformation of undercuts into fields of long-term use. This, in particular, should be explained by the parallel use of *ral* and *soh* in a number of areas of the forest zone in the early period. *Rala*, which was known here before the appearance of the plow, due to the peculiarities of its structure and functional capabilities, was successfully used on old arable land, on relatively clean areas that were not previously occupied by forest vegetation or had long been removed from the forest. But there were not many such lands here. These circumstances restrained the development of arable agriculture. A significant expansion of cultivated areas in the northern forest areas could be connected only with the transformation of forest areas into permanent fields. On a large scale and in a relatively short period of time, such a transformation could be carried out only with the help of well-adapted plowing tools specialized for these purposes. Apparently, in the needs of intensive (for its time) development of arable agriculture in the specific conditions of the northern regions with a large amount of forest vegetation, low-power podzolized soils, insufficient opportunities for the development of animal husbandry, one should see a natural condition for the appearance of plowing. At first, the plow appeared, obviously, as a plowing tool for work only in the conditions of forest fallow and the transformation of undercuts into fields of long-term use. This, in particular, should be explained by the parallel use of *ral* and *soh* in a number of areas of the forest zone in the early period. *Rala*, known here even before the appearance of the plow, due to the peculiarities of its structure and functional capabilities, were successfully used on old arable land, on relatively clean areas that were not previously occupied by forest vegetation or had long been removed from the forest. But there were not many such lands here. These circumstances restrained the development of arable agriculture. A significant expansion of cultivated

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Indeed, the high adaptability of the plow to work in the conditions of the forest zone was repeatedly emphasized in the literature (see, for example: [Demchinsky S., 1860; Egunov A., 1896; Chebyshev V., 1898; Zelenyn D., 1907, p. 131 - 136; Naidych-Moskalenko D.V., 1959, p. 48; Novikov Y.F., 1968, p. 461-470; 1964]. Thus, the lightness and maneuverability of the plow, its lack of a skid, ensured the possibility of cultivation as best as possible recently deforested areas that preserved not only large tree roots, but sometimes stumps. The same circumstances were known advantages when working on the viscous clay and loam soils of the forest zone in a relatively humid climate with a lot of precipitation in spring and in the fall, because they reduced the sticking of the working parts of the tool in the furrow, and, therefore, the force spent on overcoming the friction of the working parts of the tool against the soil. The lightness of the plow, which provided it with a one-horse team, the ability to take over the plowman's part of the effort to set the plow in motion were also important in the conditions of the forest zone, where cattle breeding was relatively poorly developed, draft animals were small and weak [Tsalkin V.Y., 1956].

As you know, the soils of the forest belt are characterized by weak sod and a weak structure. Therefore, the main agrotechnical requirement for their processing is not so much pruning and rotation of the clod, but its loosening and

mixing. Such requirements were well met by the steep installation of the plow's working bodies in relation to the ground. The two teeth of the working part, on the one hand, made it possible to work on stony soils without harm to the tool (they were characteristic of the area where the plow appeared), as well as soils littered with tree roots [Zelenyn D., 1907, p. 133, 134], and from the second - it served as a kind of counterbalance to the negative consequences of intensive loosening (spraying of the soil, reduction of its air and moisture permeability, etc.). Under the two-tooth plow, quite significant strips of land between the coulter remained untouched by tools, which "made it possible to preserve its natural physical properties longer", and can also be considered as a phenomenon that prevents water and wind erosion [Novikov Yu.F., 1962, p. 467, 468]. The presence of two relatively narrow coulters instead of one wide coulters also helped to reduce the resistance of the soil rake during the movement of the tool in it. The fact that the plow plowed shallowly, in the conditions of low-strength soils of the forest zone, initially did not cause serious negative consequences. Thus, the needs of the development of arable agriculture in the conditions of the northern regions of the forest zone not only caused the emergence of the plow, but also naturally determined the main features of its structure.

The technical solution of the plow construction turned out to be very successful. In this regard, it is impossible not to pay attention to the lamellar body of the plow, which provided the possibility of different installation of the working bodies in relation to the soil without any serious changes in the structure of the tool itself. This obviously explains the fact that during the evolution of the plow, its body did not undergo any major changes in terms of functionality.

The development of the plow mainly followed the line of changing its functional qualities, in connection with which the angle of installation of the plow, the shape and size of the coulters changed, a shelf, etc. appeared. Having arisen at the end of the 1st millennium AD. e. as a tool for work in forest fallow

conditions and the transformation of undercuts into fields of long-term use, the plow gradually turned into the main plowing tool of the steam farming system as the areas of cultivated old arable land expanded.

The oldest plows should probably be compared with those preserved in some places in the 19th century. "tzapulkam". They were effective for work only on land recently freed from the forest, could only perform shallow surface plowing. No later than the XI century. Plows appeared with more massive and stronger coded coulter, almost identical to the "ethnographic" ones, which plowed deeper, were efficient enough to work on different types of fields, in particular with heavy soils, and could be used on old plowed lands. In the XII-XIII centuries. in the central and southern areas of the forest zone, plows were spread, which had tips with a blade wider than the sleeve, initially symmetrical. These tools were characterized by an apparently more gentle setting of the rossoha. They were used, apparently, mainly on old arable land, and, perhaps, already with a wooden shelf, that is, they were transferable. In any case, in the XIII-XIV centuries. an iron shelf appeared, recorded by archaeological finds. Single-sided plows appeared no later than the 16th century, and at the end of this century, their most advanced varieties, which had a two-toothed rake and a cutter, were used. Thus, the evolution of the plow was in close mutual connection with the cultivation of land in the forest zone, the formation of the massif of old arable land and the change of farming systems caused by this process from the forest fallow to the developed tripilla.

¹Plowing, similar to that performed by a one-sided plow, could also be done with a reversible plow with feather coulter, provided it was tilted in one direction or another. At the same time, one of the coulter was in a vertical position, cutting the soil layer from the side, the other - almost horizontally, cutting the layer from below. At the same time, the width of the furrow decreased, which slowed down the work [Zelenin D., 1907, p. 50-52]. Plowing in this way was possible

only with such a plow, the plow of which had a working position close to horizontal.

²Ralo was already mentioned in the oldest monuments of writing - "Ostromyrov Evangelii", "Izbornike" of 1073, etc. [Sreznevsky I.I., 1895, vol. II, stb. 118].

³According to T.N. Korobushkina, plows appeared on the territory of Belarus already in the 10th century. The basis for such a conclusion was the discovery of a fragment of the blade of an iron tip of an iron plowing tool from the layer of the ancient Lukoml settlement of this time (Korobushkinoy T.N., 1979, figs. 4, 5 and table 1). This sherd, however, cannot be accurately interpreted as belonging to coulter or naralniks due to its small size and indistinctness.

CONCLUSIONS

Traditional plowing tools of the peoples of Eastern Europe had a long history. The main, general direction of their development in ancient times and the Middle Ages was adaptation to the most efficient work in different soil and climatic conditions under the changing technology of agricultural production. From this point of view, three most important turning points can be identified in the history of Eastern European plowing tools: the transformation of the plow from a primitive furrowing tool into a loosening and plowing tool; the appearance of the plow, which marked the completion of the formation of a specific agricultural technology in the forest zone, different from the one that prevailed in the southern regions; the appearance of the plow, which turned the scythe and which quickly replaced the plow as the main tillage tool in the forest-steppe, on the southern edges of the forest zone and in the steppes. Advances in the technology of smelting and processing iron, which made it possible to mass-equip plowing tools with iron working tips, had a huge impact on the development of plowing tools.

The forms in which the historical development of Eastern European plowing tools took place were diverse. In different areas and at different times, racks received racks, gradually empirically selected the most optimal place for the connection of the traction force with the body of the tool, the shape of the handles in the rack, or the degree of inclination of the shaft in the saw. The development of iron tips for plowing tools was slow and gradual, which was manifested in the change of their sizes and the selection of the most perfect forms from a technical and technological point of view. The result of such a slow and gradual evolutionary development was a huge variety of variants of traditional plowing tools, which is noted by ethnography. But the history of

plowing tools also knows rapid, leap-like changes that significantly change their working qualities and the structure of the frame. Inventions of this kind usually occurred in one or a few centers, from where they spread to large areas. Examples of this type can be the appearance of the plow, a fundamentally new tool in terms of its working qualities, which best met the requirements of agricultural technology in the forest zone, and the plow, which took place in Eastern Europe in three different and limited areas and at different times based on different technical principles.

Of course, sudden changes in plowing tools could not take place without taking into account past experience, which manifests one of the most important laws of the development of technology in general and agricultural technology in particular, and is even limited to a certain extent by the level of such experience.

In this regard, for example, the necessary conditions for the invention of the first plows were, on the one hand, the wide use of improved plows in the area of their origin, equipped with wide-bladed plowshares, combs, and a wheel front, and on the other hand, familiarity with plowing with a skid turn, awareness of its advantages.

In the process of historical development of plowing tools, there were also moments of return to simple forms under the influence of new conditions. So, harrow harrows, especially in versions with a handle or handles formed by root processes, look more archaic than harrow harrows in terms of the degree of complexity of the device. However, the available data force us to consider them in Eastern Europe as later ones, as those that appeared as a result of the development of gabled crooked gables under certain conditions. Another example of this kind can serve as the simplification of the construction of Eastern European plows after the appearance of the plow and plowshare. From the point of view of the general development of the technique and technology of soil cultivation, we should consider this phenomenon as progressive, as a

differentiation of tools that perform different functions in a complicated technological process.

Among the factors that determined the historical development of Eastern European plowing tools and influenced the peculiarities of their design, socio-economic and physical-geographical conditions draw attention.

Speaking about the natural conditions for the appearance of certain types of plowing tools, we already had the opportunity to note that the change in their functional qualities, closely related to a number of constructive innovations, the replacement of outdated tools with new, more productive ones, took place with the growth and complication of social needs, caused by, ultimately, the socio-economic development of society. The level of socio-economic development of society through craft production limited the degree of distribution and nature of iron tips and to a certain extent - the degree of complexity of the design of plowing tools themselves. It is no coincidence, perhaps, that the first reliable data on plows in all areas of the European "plow zone" refer only to the period when the process of separating the craft from agriculture went far enough, and the craft itself, especially the smelting and processing of ferrous metal, reached a relatively high level .

Among the factors of the physical and geographical order, the nature and structure of plowing tools had the greatest influence on the soil, the characteristics of which, in turn, are determined by the climate and predominant natural vegetation. So, for areas with steppe and meadow type soils, characterized by a more or less thick humus horizon, developed herbaceous vegetation, homogeneity of mechanical properties (steppe, forest-steppe, southern edges of the forest zone), most typical both in ancient times and in the recent past were tools with a low location of the point of application of traction force, which had a more or less developed skid, were stable on the move, and plowed relatively deeply. Such were many of the plows used in these areas, as

well as plows. At the same time, in the main areas of the forest zone, where weak podzolized soils prevailed, which often had heterogeneous mechanical properties, littered with stones of glacial origin, and sometimes with the remains of the root system of trees, where the natural grass cover was not so developed, other tools were needed - light and turns, which easily leave the soil in case of encountering obstacles or changes in its mechanical composition, and just as easily enter the soil. The depth of plowing on such lands did not play such a significant role as in the southern regions. The maneuverability of such tools was achieved by increasing the point of application of the traction force, which led to the replacement of the horizontal slide with a working part that is at a significant angle to the ground. Such were some types of plows that were used in the considered period in the forest zone, as well as plows.

However, there was still no clear and unequivocal correlation between the nature of the soil and the specified features of the construction of plowing tools. As we were able to see, both plows with a close to horizontal position of the working part and plows were used in the forest zone. At the same time, plows without skids were known in steppe and forest-steppe areas, plows already in the 16th century. penetrated into the forest-steppe, and in the middle of the XIX century. were used even in some steppe areas. Obviously, the influence of physical and geographical conditions on the nature of plowing tools was largely limited by other factors.

In connection with this, we should note, firstly, that the physical and geographical conditions of a particular region in general, and in particular the nature of the soil, are significantly influenced by human economic activity. Thus, long-term cultivation of the soil with plowing tools leads to the creation of large massifs of old arable land, which are characterized by a uniform mechanical composition and a humus horizon deeper than on uncultivated land. Secondly, the impact of physical-geographical and socio-economic factors on

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the development of plowing tools occurs, apparently, not so much directly, but through the mediation of farming systems with a limited set of soil cultivation technologies, characteristic of each of them.

However, it is also hardly possible to trace a direct connection between plowing tools and farming systems: the same types of plowing tools could be used in different farming systems, although not all of them. At the same time, such a connection was probably mutual: the emergence due to certain social needs of the elements of a new agricultural system sometimes required new tillage tools, and the appearance of the latter contributed to the further development of this new system. Thus, the development of the forest fallow probably began even when plows dominated the forest zone, but it was able to become widespread only with the appearance of the plow. The steam system consisted in the presence of only plows in the forest-steppe zone, and plowless plows in the forest zone, but its development was associated with plows and plows that had a movable or fixed shelf. The mentioned circumstances explain well the spread of East European plows to the north, in the forest areas, as significant massifs of old arable land cultivated by the steam system were formed there. The same circumstances can to some extent explain, for example, the spread of plows with skids in the forest zone, and skidless ones - in the steppe and forest-steppe, or the spread of plows far to the south.

However, such an explanation is unlikely to be comprehensive. And in this connection, it is necessary to pay attention to the following circumstance. Folk tools of the recent past are not accidentally called traditional, emphasizing, on the one hand, a kind of "attachment" of a person to the existing tools and the skills of working with them, and on the other hand, the relative immutability, the traditionality of their manufacture. Traditions begin where human society begins, and are primarily a form of consolidation and dissemination of rational experience of practical human activity. The traditions underlying the

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transmission of experience in the manufacture and use of certain plowing tools can be called technical. They arise in certain historical conditions and are determined primarily by the level of socio-economic development of society, the natural environment, the requirements of certain systems and technologies of agricultural production, in the conditions of which this plowing tool appears.

But compliance with certain and the same conditions of the external environment and agricultural technology at a given level of development of productive forces can be achieved when creating plowing tools in different ways, in different forms. This leads to the possibility of the emergence of different technical traditions of making, in fact, functionally identical tools. Therefore, in plowing tools, certain traditions are most clearly manifested in the characteristic features of the relationship of the main parts, that is, in the arrangement of their body, as well as in various small details of the arrangement of its component parts.

Having arisen under the influence of the above-mentioned conditions, this or that technical tradition of the manufacture and use of plowing implements acquires a certain stability, independence, and is fixed in the production experience of a number of generations. It can exist in one form or another even when the conditions that gave rise to it change and turn out to be long forgotten, thus turning into a cultural-historical tradition. Of course, such traditions do not always remain unchanged. But the pace of their change usually lags behind the pace of socio-economic development of those peoples who created or borrowed it. They change only gradually when the tool is transferred from an environment with the same soil and climatic conditions to another environment, significantly different from the first one, as well as when the technology of agricultural production changes.

When clarifying the role of traditions, it is important to consider that, along with tools, the main element of productive forces is a person with his

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knowledge, experience, and work skills. Therefore, the transmission of agricultural skills from generation to generation in the past, before the introduction of science into agriculture, was always one way or another connected with ethno-cultural traditions.

The ancient and medieval history of Eastern European plowing tools provides numerous examples of the significant influence of traditions on the design of their various varieties. The earliest plowing implements in the region under consideration belonged to two types of plows, which differ sharply in their design features - curved-bladed and single-handled straight-bladed plows. The main structural features of these types traditionally continued to exist until the end of the period we are interested in, and were later recorded by ethnography. In fact, it is to these most ancient types that all known varieties of plows on the territory of Eastern Europe can be genetically reduced. Moreover, the structure of the body of Eastern European plows clearly shows the traditional continuity with the design of single-handle straight-shaft plows. Even in the structure of the plough, the most peculiar Eastern European plowing tool, you can catch some features that traditionally connect it with plows, which were used in the area of its origin. Traditions expressed in the basic scheme of the design of plowing tools, changing, becoming more complicated and supplemented, were passed down from generation to generation for many centuries and can be traced to tools of various functional purposes.

The differences observed in the Middle Ages between Eastern European plows, on the one hand, and Central and Western European plows, on the other, are explained primarily by different traditions that arose with the relatively independent appearance of this new type of plowing implement in different areas of the European "plow zone". Obviously, first of all, traditions should explain the already mentioned fact that the oldest plows in the forest zone of Eastern Europe belonged to the varieties that had a skid. Obviously, plowing

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tools that developed in other ecological conditions penetrated into the forest areas together with arable agriculture and were traditionally used here for some time, although their design and functional features were not sufficiently adapted to the conditions of the new areas of their use. Later, they were transformed into tools without a skid, more adapted to the conditions of work in forest areas, or were replaced by other tools, such as a saw. Probably, the spread of the plow in the forest-steppe and steppe should be explained not only by applied farming systems, but also by tradition.

The question of the extent to which traditions in agricultural machinery are ethnic and, in general, about the ethnic specificity of agricultural tools, in particular plowing tools, is still hotly debated. The ancient and medieval history of Eastern European plowing tools does not provide sufficiently clear data for its solution, firstly, because it is sometimes difficult to trace ethnic boundaries based on archaeological materials, on which we have to rely to a large extent, and secondly, because it is the most important, given the incompleteness and fragmentation of available information on plowing tools and their habitats.

As the data of ethnography show, the boundaries of the spread of agricultural technology rarely coincide with the boundaries of ethnic groups, showing a closer connection with the boundaries of economic-cultural types or historical-ethnographic regions, which, however, is also not always observed. The same phenomenon can be traced in the material discussed above, but given the nature of the sources - less clearly. At the same time, it is necessary to recognize the legality of including among ethnic traditions not only those signs that perform ethnodifferentiating functions, but also a number of cultural features that unite several ethnic groups. Such are many types of traditional plowing tools. In addition, the peculiarities of the latter at the borders of economic and cultural types and historical and ethnographic regions can still play an ethnodifferentiating role. All this does not make it possible to

categorically deny the presence of ethnic specificity in agricultural technology, especially since the bearers of traditions have always been living people, representatives of specific ethnic groups.

In this regard, such phenomena as, for example, the coincidence of the territory of the Prague-Korchatsky and Prague-Penkiv type cultures, on the one hand, and the range of generally later plowshares of the IV2 type, on the other hand, are significant differences in the shapes and proportions of ploughshares of the pre-Mongol era in in Kyivan Rus and in Volga Bulgaria, which can testify to the differences in the details of the structure of the plowing tools themselves, which were equipped with these tips. Obviously, the use of a plow in certain periods could be an ethno-differentiating feature, first - for one of the northern ethnic or ethnographic groups of Eastern Slavs, later - for all Eastern Slavs in the forest zone, but only on some borders of their range. It does not yet seem possible to clearly trace the ethnic specificity of other ancient and medieval Eastern European plowing tools based on the available materials.

Thus, the genesis of traditional plowing tools of the peoples of Eastern Europe should be considered as a complex and long historical process caused by a complex of various factors. The leading role among the latter was played by factors of the socio-economic and physical-geographic order, which exerted their influence on the historical development of plowing tools mainly through farming systems, as well as technical and cultural-historical traditions of various origins, among which ethnic traditions could play a prominent role.

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