

BIPALIUM – AGRICULTURAL IMPLEMENT OR TECHNIQUE OF TURNING THE SOIL?*

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An enormous role in the agriculture of ancient Italy was played by the use of various kinds of hoes and spades in the manual cultivation of the soil. The very large proportion of manual labour among all agrotechnical procedures was responsible for the very labour-intensive state of agriculture, and this in its turn affected many aspects of economic life in Italy¹. According to the norms of labour found in the treatise of the Sasernae, whose calculations were later adopted by Columella (*Rust.* II 12), the cultivation of one *iugerum* of land sown with grain took ten and a half days. Of these, four days were dedicated to plowing, one and a half days to harvesting, and the remaining five days to a series of agrotechnical procedures which were carried out manually, such as harrowing (*occatio*) or else hoeing and weeding (*sartio* and *runcatio*). Manual labour with the aid of hoes and spades also played an enormous role in the cultivation of vineyards and gardens. Unfortunately, the problem of manual cultivation of the soil, despite its importance, has found almost no reflection in literature². Although the ancient plow has been discussed on many occasions, manual agricultural implements have gone almost completely unresearched. Only lately has K.D. WHITE's³ insightful book dedicated also to this category of implements appeared in print.

The focus of this article is *bipalium*, a term associated with the manual cultivation of the soil. This word appears many times in the agronomical works of

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¹ J. KOLENDO, *Postęp techniczny a problem siły roboczej w rolnictwie starożytnej Italii*, Wrocław 1968; IDEM, *Le travail à bras et le progrès technique dans l'agriculture de l'Italie antique*, Acta Poloniae Historica XVIII, pp. 51–62.

² Cf. Ch. PARAIN, *Les anciennes techniques agricoles*, RS LXXVIII 1957, p. 326: "Il est devenu nécessaire de constituer toute une ethnographie, toute une histoire de la houe".

³ K.D. WHITE, *Agricultural Implements of the Roman World*, Cambridge 1967; cf. J. KOLENDO, *W sprawie metody badań rzymskich narzędzi rolniczych. Na marginesie książki K.D. White*, Archeologia XXII 1971, pp. 204–213.



The gravestone of Leo discovered in the catacombs of St. Callixtus in Rome.
After R. FABRETTI, *Inscriptionum antiquarum quae in aedibus paternis
asservantur explicatio*, Romae 1702, p. 574, no. 60.

Cato, Varro, Columella and in the *Historia naturalis* of Pliny the Elder⁴. This term is universally explained in dictionaries⁵, encyclopaedias⁶, commentaries to the texts of the *Scriptores rei rusticae*⁷ and works dedicated to the history of Roman agriculture⁸ as a special kind of spade that was used for a deep turning over of the soil. This interpretation was based on the etymology of the word (*bipalium*). It was believed that this was a double spade (*pala*)⁹.

As a rule, *bipalium* is identified with a spade that, above the working section of the shaft, has a crossbar (pedal) that is used to press this tool with the foot. An iconographical representation of just such a spade appears on the gravestone

⁴ Summary of locations in *ThLL* II, col. 1999; cf. K.D. WHITE, *op. cit.* (n. 3), p. 20 f.

⁵ See standard dictionaries, e.g. FORCELLINI's *Lexicon totius latinitatis* and *OLD* s.v.

⁶ A. RICH, *Dictionnaire des antiquités romaines et grecques*, Paris 1873, p. 81; Ch. DAREMBERG, E. SAGLIO (eds.), *Dictionnaire des antiquités grecques et romaines*, vol. I, Paris 1873, p. 711: *bipalium* (E. SAGLIO); F. CABROL, *Dictionnaire d'archéologie chrétienne et de liturgie*, vol. II, Paris 1907, coll. 631 f.: *bêche* (H. LECLERCQ).

⁷ H.B. ASH, in: Lucius Junius Moderatus Columella, *On Agriculture*, vol. I, London 1940, p. 266, n. a; M.E. SERGEENKO, in: Mark Porcij Katon, *Zemledelie*, Moskva-Leningrad 1950, p. 133, n. 5; A. MAZZARINO, in: M. Porci Catonis *De agri cultura*, Lipsiae 1962, p. 123 (index in the *instrumentum mutum* section); P. THIELSCHER, *Des Marcus Cato Belehrung über die Landwirtschaft*, Berlin 1963, pp. 201 f.

⁸ M. MONGEZ, *Mémoire sur les instruments d'agriculture employés par les anciens*, Histoire et mémoires de l'Institut Royal de France, Classe d'Histoire et de la Littérature Ancienne, vol. III 1818, pp. 11 f.; M.G. BRUNO, *Il lessico agricolo latino e le sue continuazioni romanze*, RIL XCI-XCII 1957-1958, p. 414, no. 166; WHITE, *op. cit.* (n. 3), pp. 20-24 (foot-rest spade).

⁹ *RE* XVIII 2 (1949), coll. 2441-2443: *pala* (E. SCHUPPE); WHITE, *op. cit.* (n. 3), pp. 17-20 and 27 ff.

of Leo, which was found in the catacombs of St. Callixtus in Rome. This artifact is known only from the drawing in the corpus of inscriptions of FABRETTI¹⁰. The gravestone of Leo shows a man holding in his right hand a two-bladed hoe (*bidens*¹¹). On his right is the spade described above which is generally called *bipalium*, and a knife used to cut grapevines (*falx vinitoria*¹²), and on his left there is a tree and a dog. In the description of this artifact given in Latin by FABRETTI, the spade was called *bipalium*. The implement represented on the gravestone of Leon could in reality serve for the digging of soil to a depth of 25–35 cm¹³. This type of spade could enter the earth as far as the crossbar.

FABRETTI'S description became in the encyclopaedias of RICH, DAREMBERG–SAGLIO and in a series of later works¹⁴ the basis of identification of the name *bipalium* with the iconographic representation described above. The association of the iconographic source with the data contained in the texts served in its turn as a basis for a detailed reconstruction of the appearance and function of this implement. According to E. SAGLIO¹⁵, *bipalium* is a

bêche munie d'une barre transversale un peu au-dessus du fer, sur laquelle on posait le pied au lieu d'appuyer sur le fer même, comme on fait ordinairement en creusant la terre. On pouvait de cette manière enfoncer l'outil avec plus de force et plus ou moins profondément, selon que la barre était placée à une hauteur plus ou moins grande (*bipalium altum, non altum*).

It was sometimes assumed that by metonymy *bipalium* can also denote the depth of the overturned soil (approximately two times 19.851 cm or the so-called *Spatenstich*)¹⁶. There were some quite isolated opinions that the term *bipalium* should be understood exclusively in this meaning. J.G. SCHNEIDER¹⁷ in the commentary to his edition of the *Scriptores rei rusticae* drew attention to the fact that “*bipalium esse mensuram aliquam, vel modum fossionis, non instrumentum aliquod, fossioni aptum*”. This interpretation was adopted by G. FURLANETTO,

¹⁰ R. FABRETTI, *Inscriptionum antiquarum quae in aedibus paternis asservantur explicatio*, Romae 1702, p. 574, no. 60. Cf. THIELSCHER, *op. cit.* (n. 7), p. 202 and tabl. 3.

¹¹ WHITE, *op. cit.* (n. 3), pp. 47–52.

¹² E. DE SAINT-DENIS, *Falx vinitoria. Archéologie et philologie*, RA XLI–XLII 1953, pp. 163–176; WHITE, *op. cit.* (n. 3), pp. 93–98.

¹³ Cf. H.J. HOPFEN, *L'outillage agricole pour les régions arides et tropicales*, Rome 1960, p. 40.

¹⁴ THIELSCHER, *op. cit.* (n. 7), p. 202; WHITE, *op. cit.* (n. 3), p. 23.

¹⁵ SAGLIO, *loc. cit.* (n. 6). A very similar description is given by RICH, *loc. cit.* (n. 6).

¹⁶ OLCK, *RE* III 1 (1897), col. 488; SAGLIO, *loc. cit.* (n. 6); K.E. GEORGES, *Ausführliches lateinisch-deutsches Handwörterbuch*, Hannover–Leipzig 81913, col. 832: “meton. der Doppelspatenstich”; A. ERNOUT, A. MEILLET, *Dictionnaire étymologique de la langue latine*, Paris 41959, p. 475; *Słownik lacińsko-polski*, ed. M. PLEZIA, Warszawa 1959, p. 367.

¹⁷ J.G. SCHNEIDER, *Scriptorum rei rusticae veterum latinorum*, vol. II 2, Lipsiae 1794, p. 674; cf. vol. IV, p. 119.

who in 1827 published the enlarged and corrected edition of FORCELLINI's dictionary. In 1848, this understanding of the term *bipalium* was given a wider validation by R. KLOTZ¹⁸. This interpretation, although registered in later editions of FORCELLINI's dictionary, was basically not noticed. In fact, at the time of the 1889 publication of the gloss¹⁹: "*bipalium* (MSS *bipallum*) *ferramentum rusticum*", it could be assumed that the question was in essence completely resolved.

A closer analysis of the texts of the *Scriptores rei rusticae*, based on a familiarity with the methods of using a spade and not limited to the places where the term *bipalium* is found but investigating as well instructions pertaining to the manual cultivation of the soil, permits us, in my opinion, to return to the interpretation which was suggested in 1794 by J.G. SCHNEIDER, and validated by R. KLOTZ in 1848.

The word *bipalium* is found in texts which deal with the depth to which soil has to be turned over, the so-called *pastinatio*²⁰. This very labour-intensive agro-technical procedure²¹ was used when starting nurseries, planting grapevines, and in the cultivation of gardens. A series of texts explicitly indicates that *bipalium* is *altitudo pastinationis*. Concrete data about the depth to which the soil was turned is given in the following table²²:

Bipalium: the depth to which the soil is turned

SOURCE	NAME	DEPTH TO WHICH THE SOIL IS TURNED	
		IN FEET	IN CM
Col. <i>Rust.</i> III 5, 3	<i>bipalium</i>	<i>in duos et semissem convertitur humus</i>	75 cm
Col. <i>Rust.</i> IV 30, 3	<i>bipalium</i>	<i>in duos pedes et semissem pastinare</i>	75 cm
Col. <i>Rust.</i> XI 2, 17	<i>bipalium</i>	<i>altitudo duorum pedum</i>	60 cm
Col. <i>De arb.</i> 1, 5	<i>bipalium quod vocant rustici sestertium</i>	<i>ea repastinatio altitudinis habet plus sesquipedem, minus tamen quam duos pedes</i>	more than 45 cm, less than 60 cm
Col. <i>Rust.</i> XI 3, 11	<i>non alto bipalio</i>	<i>minus quam duos pedes ferramento novale converti</i>	less than 60 cm
Plin. <i>HN</i> XVIII 159	<i>bipalium altum</i>	<i>pastinari debet ternos pedes</i>	90 cm

¹⁸ R. KLOTZ, *Miscelle XI*, Neue Jahrb. Suppl. XIV 1848, p. 320.

¹⁹ *Glossae codicum Vaticani 3321, Sangallensis 912, Leidensis 67 F*, ed. G. GOETZ, Lipsiae 1889 (Corpus Glossariorum Latinorum, vol. IV), p. 25, 60; cf. vol. VI, p. 142.

²⁰ A detailed description of the technique of *pastinatio* is found in Columella, *Rust.* III 13.

²¹ Cf. Col. *Rust.* XI 2,17: "Pastinatur autem terreni iugerum ita, ut solum in altitudinem trium pedum defodiatur operis LXXX: vel in altitudinem dupondii semmissis operis L: vel ad bipalium quae est altitudo duorum pedum, operis XL".

²² The calculation of depth in cm is approximate. One foot actually equals 29.63 cm.

Bipalium is the measurement of turning the soil to a depth of two feet (60 cm) or two and a half feet (75 cm). There were also derived terms, such as *bipalium altum* (three feet = 90 cm) and *bipalium non altum* (less than two feet, therefore less than 60 cm). One of the so-called *rusticae voces* referred to a *bipalium* which countrymen called *sestertium*. Its depth measured more than 45 cm and less than 60 cm. *Bipalium*, therefore, indicated a quite peculiar unit of measurement of the depth to which the soil was turned (*pastinatio*). At first glance, it may appear that this measurement was quite imprecise. Even for the same author, some texts say that *bipalium* is turning the soil to a depth of two feet, others, two and a half. These differences, however, did not interfere in the measuring of the depth of the *pastinatio*²³. They may instead be suggesting the existence of certain differences in the method of carrying out this agricultural procedure, associated with natural conditions, the type of crop²⁴, or the type of agriculture²⁵. In one area, *bipalium* could have measured two feet, while in others it measured two and a half feet.

In Cato and Varro in particular, we frequently come across the phrase *bipalio vertere*²⁶. Columella who gives a detailed description of the manner of carrying out *pastinatio* may give us the explanation of this phrase. This author²⁷ is against the widely used practice of his time which consists in the gradual removal of layers of soil, most probably over large areas so as to reach the desired depth only at the second or third repetition. Columella himself believed that the soil should immediately be dug to the desired depth. His recommendations focus on the necessity of digging furrows with regular, vertical sides. In this way, the

²³ Cf. W. KULA, *Miary i ludzie*, Warszawa 1970, p. 63 – interesting comments on the changing of measurements which have some kind of meaning.

²⁴ In *Rust.* III 13, 8, Columella discusses the dependence of the depth of *pastinatio* on natural conditions; cf. also XI 3, 11 – dependence on the amount of water in the soil; IV 32, 1: “Harundo minus alto pastinatio, melius tamen bipalio seritur”.

²⁵ Col. *Rust.* III 13, 5: “At qui pastinationis impensam reformidant, sed aliqua tamen parte pastinationem imitari student [...] sulcos dirigunt”. Columella, a supporter of intensive economy, recommends a deeper turning over of the soil than Cornelius Celsus in his description of extensive economy. Cf. *ibid.* IV 1: “quosdam repertos esse ais qui cetera quidem nostra praecepta laudassent, unum tamen atque alterum reprehendissent; quippe seminibus vineaticis nimium me profundos censusse fieri scribes adiecto dodrante super altitudinem bipedaneam, quam Celsus (fr. XIV F. MARX) et Atticus prodiderant”. On the tendencies of the treatise of Columella, see J. KOLENDO, *Postep...* (n. 1), pp. 30–33.

²⁶ Cato 6, 3 (cited by Varro, *Rust.* I 24, 4); 46, 1; 48, 1; 151, 2; Varro, *Rust.* I 37, 5 (quoted in 29 below); Col. *De arb.* 1, 5; Plin. *HN* XVIII 236. Cf. *bipalio convertere* – Col. *Rust.* IV 30, 3; XI 3, 11.

²⁷ Col. *Rust.* III 13, 9: “Primum autem praedicti operis exordium est, non ut huius temporis plerique faciunt agricolae, sulcum paulatim exaltare et ita secundo vel tertio gradu pervenire ad destinatam pastinationis altitudinem; sed protinus aequaliter linea posita rectis lateribus perpetuam fossam educere et post tergum motam humum componere, atque in tantum deprimere donec altitudinis mensuram datam ceperit”.

entire expanse of soil would gradually be turned over to the desired depth with regular furrows.

In the light of this text, we must accept that *bipalium* is the turning over of the soil to a depth of two spades (*pala*), or more exactly, “two measures”. But was it possible to turn the soil over by these “two measures” to a depth of 60–75 cm? A knowledge of modern techniques permits us to conclude that a spade, particularly one equipped with a pedal, made it possible to turn the soil over to a depth of 25–35 cm²⁸. In practice, however, when turning over to greater depths, one takes off somewhat thinner layers of soil. In the case of turning the soil over to a depth of 60 cm, it was possible to do so “in two measures”. In the case of turning the soil to a depth of 75 cm, however, it was necessary to remove and throw to the side two layers of soil (two “measures”) and then turn over in place a third layer. The soil that had been thrown to the side served to cover the furrow that had been previously dug. This reconstruction of the technique of *pastinatio* which is compatible with the description of Columella may constitute the complete explanation for the term *bipalium*. This term was connected with the fact of throwing two “measures” of earth to the side. These two, thrown to the side, and one turned over in place would total a depth of 60–75 cm. Each “measure”, therefore, had a depth of 20–25 cm, which is completely in accord with modern practice.

A confirmation of this interpretation of the term *bipalium* as presented above may be found in the analysis of the name *sestertium* (literally: two and a half) which refers to the turning over of the soil to a depth greater than 45 cm and less than 60 cm. *Sestertium* becomes obvious when we accept that this referred to two and a half “measures”. Each “measure” in this case would be greater than 18 cm and less than 24 cm. It should be accepted, therefore, that *bipalium* is the technique of the deep turning over of the soil. An analysis of the text of Varro²⁹, which contains a classification of various means of mechanical cultivation of the soil. Mentioned there successively were plowing, digging the soil and *bipalio vertenda terra* to greater or lesser depths.

A technological analysis completely rules out current interpretations of *bipalium* as a special type of spade³⁰. The turning over of the soil to a depth of 60–75 cm cannot be done by means of a “double spade”. An increase in the length of working part of the spade does not render the employing this technique to a greater depth easier or faster, particularly when large areas are involved. A “double spade” would be a technological nonsense. It is also difficult to accept

²⁸ Cf. n. 13.

²⁹ Varro, *Rust.* I 37, 5: “ad alia arandum aut fodiendum, ut si segetes instituas; ad quaedam bipalio vertenda terra plus aut minus”.

³⁰ For the size of spades discovered in the areas buried by the eruption of Mt. Vesuvius in 79 AD, see WHITE, *op. cit.* (n. 3), p. 24.

that the the name of the method of turning over the soil passed to the implement used for this purpose. Special spades used for the turning over of soil for a depth of two “measures” could not have existed. An ordinary spade, used for various tasks, was sufficient. The information provided by the gloss, that *bipalium* is a *ferramentum rusticum*, should be considered as imprecise³¹. This would constitute the same type of error that was committed by modern investigators, when they interpreted *bipalium* found in the texts of the *Scriptores rei rusticae* as meaning “spade”.

Summarizing the arguments presented above, we can conclude that the name *bipalium* refers to the technique of turning over the soil to a great depth (60–75 cm), with the first two layers removed and the third turned over in place. By metonymy, the term could also have signified the depth of the soil that was turned over by means of this technique.

³¹ On the value of glosses, see M.G. BRUNO, *Apporti dalle glosse alla conoscenza del lessico agricolo latino*, RIL XCIII 1959, pp. 115–154.