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Farming and stock-breeding in the La Tène culture communities in Poland

ABSTRACT

In this article, the basic information on the research on the economy of the La Tène culture communities living in the southern part of Poland in the early and middle La Tène period is presented. The analysis of natural data shows that the local economy of the Celtic settlers from Silesia and Lesser Poland did not differ in quality from that of their countrymen from the area south of the Carpathians and the Sudetes. Agriculture was based on the cultivation of cereals, among which different varieties of wheat dominated with a relatively small share of barley and common millet. Contrary to earlier opinions, rye and oat cultivation was not widespread. In typical rural settlements, cattle farming was by far the dominant activity. Breeding swine and small ruminants were in the second position, but the proportion between these species varied from region to region. The very small proportion of wild animal bones known from the surveyed settlements indicates an advanced process of deforestation of the inhabited area and well-developed domestic animal husbandry.

KEYWORDS

La Tène culture, farming, stock-breeding, settlement, archaeozoology, archaeobotany



I. INTRODUCTION

The key factor to understand the economy of prehistoric communities is a thorough investigation of settlement sites, which in contrast to sepulchral sites were rarely the subject of regular excavation. This disproportion was particularly evident in case of the Iron Age sites surveyed in modern Poland. This situation has changed slightly in the last thirty years as a result of numerous rescue excavations, mainly in connection with the construction of roads and motorways, but the amount of information obtained during these activities has not always been satisfactory. As far as the La Tène culture is concerned, only a few sites were found in the area of the mentioned developments and they enriched the osteological and botanical material necessary for the analysis of the agricultural and breeding economy of the La Tène communities in southern Poland. These include sites no. 11-12 in Śleza, Wrocław district (Dulęba 2019a), site 2 in Zagórze, Wieliczka district (Dulęba *et al.* 2012, 321–342), site 17 in Podłęże, Wieliczka district (Dzięgielewski *et al.* 2011, 315–348). Another problem is posed by the researchers themselves, who when carrying out stationary excavations often do not attach much importance to proper documentation of archaeobotanical and archaeozoological materials, do not publish the results of their research and do not make the materials available. To make matters worse, the flagship site of the La Tène culture at Nowa Cerekwia, Głubczyce district, which could have provided the most interesting data, was largely destroyed already in the 19th century. Due to surface research carried out as part of the Archaeological Picture of Poland, 750 archaeological sites of the La Tène culture have been documented so far, only about 50 of which are sepulchral sites. Settlement sites of the La Tène culture were explored at only 37 sites (Table 1). Thus, against the backdrop of research on other Iron Age cultures, this number is not impressive, although the fact of the existence of a stable and long-lasting Celtic settlement in four regions of southern Poland is undeniable. Naturally, in the literature on the subject, the economy of the La Tène culture has not been given enough attention (Klichowska 1961; Wielowiejski 1967; Woźniak 1970, 218–229; Godłowski 1983). The information contained in quoted publications is usually laconic and in no way exhaustive. Moreover, in case of the most valuable set of osteological data from the Nowa Cerekwia site, detailed analyses carried out by Professor Kazimierz Myczkowski from the former Agricultural Academy in Wrocław (Czerska 1963, 300–301) concerned only a part of the collection and the materials from that research were lost. The systematic excavations carried out in

TABLE 1. General characteristics of features surveyed in the settlements of La Tène culture (compiled by P. Dulęba)

Nr	Place name	Site	Post-hole constructions	Pit-houses	Variouse pits	Production devices
Lower Silesia						
1	Górzec	13		X		
2	Kurzątkowice	1		X	X	X
3	Mokronos Dolny	7	X			X
4	Pożarzyce	12			X	
5	Radzików	4			X	
6	Ślęza	11-12	X	X	X	
7	Wrocław-Partynice	6		X	X	
8	Wiązów	2			X	
Upper Silesia						
9	Dzierżysławice	10			X	
10	Gościęcin	15			X	
11	Krzanowice	20			X	
12	Ligota Mała	1			X	
13	Łany	24		X	X	
14	Nowa Cerekwia	4	X	X	X	X
15	Roszowski Las	25(6)		X	X	X
16	Roszowski Las	28(11)		X	X	
17	Roszowski Las	29(22)		X	X	
18	Samborowice	13	X	X	X	X
19	Samborowice	17		X	X	
20	Sułków	14			X	X
21	Szonów	22		X		
Western Lesser Poland						
22	Barycz	7			X	
23	Dalewice	1		X	X	
24	Michałowice	20			X	
25	Kraków-Pleszów	17-20		X	X	
26	Kraków-Wyciąże	5		X	X	X
27	Pełczyńska	1	X	X	X	X
28	Podłęże	17		X	X	X
29	Słonowice	5		X		
30	Strumiany	4		X	X	
31	Zagórze	2	X	X	X	
32	Zagórzycze	1		X		
33	Zakrzów	13			X	
Eastern Lesser Poland						
34	Bachórz	16		X		
35	Lipnik	3		X	X	
36	Sanok-Biała Góra	3		X		
37	Sanok	59-60		X		

Samborowice in recent years, closely connected with the research of Celtic colonisation in Upper Silesia, provided many valuable archaeobotanical and osteological data (Dulęba *et al.* 2021), but are still only a drop in the ocean of needs. The authors of this article, aware of the relatively small amount of data available to them, decided to collect the existing data and attempted to analyse them. This publication should therefore be treated primarily as a starting point for further research into the economy of the Celts in southern Poland.

II. GENERAL CHARACTERISTICS OF THE CELTIC SETTLEMENTS IN POLAND

The geographical conditions of southern Poland were favourable for the existence of prehistoric settlements. This is a highland area, with a very varied relief and an extensive water network. Numerous valleys of small watercourses were perfect for settlement. The places where Celtic settlements are recorded (Fig. 1) are among the most agriculturally attractive areas of contemporary Poland. In order to provide themselves with the most favourable living conditions, the Celtic settlers carefully selected places to settle. They preferred especially loess soils or soils similar to them formed from other silty formations (Fig. 2), which is well visible in almost the whole area of Central Europe, covered by intensive settlement of the La Tène culture (Filip 1956, 62–77). Slightly worse conditions for the development of agriculture are recorded in eastern Lesser Poland, where only a part of the territory occupied by Celtic settlers is very fertile loess soils. Another stimulus for the establishment of settlements could have been salt, rich deposits of which are located in the vicinity of Wieliczka and Bochnia in western Lesser Poland (Jodłowski 1971, 87–91). In the Middle Ages, mines where this mineral was mined were established, which brought enormous profits to the then Kingdom of Poland, but more and more numerous finds confirm that salt was extracted there already in the Neolithic period from salty springs occurring in this area. It is also presumed that a similar situation could have taken place in areas of eastern Lesser Poland where such springs also occur and could have been used during the Iron Age (Parczewski 1978, 146, fig. 6; Bochnak 2019, 36–37). Surface research carried out within the contemporary boundaries of Poland has revealed the outstandingly extensive character of the Celtic settlement. Until now, the prevailing belief was that the Celtic settlements in Silesia and Lesser Poland were small, isolated, single-farmstead settlements. However, recent excavations

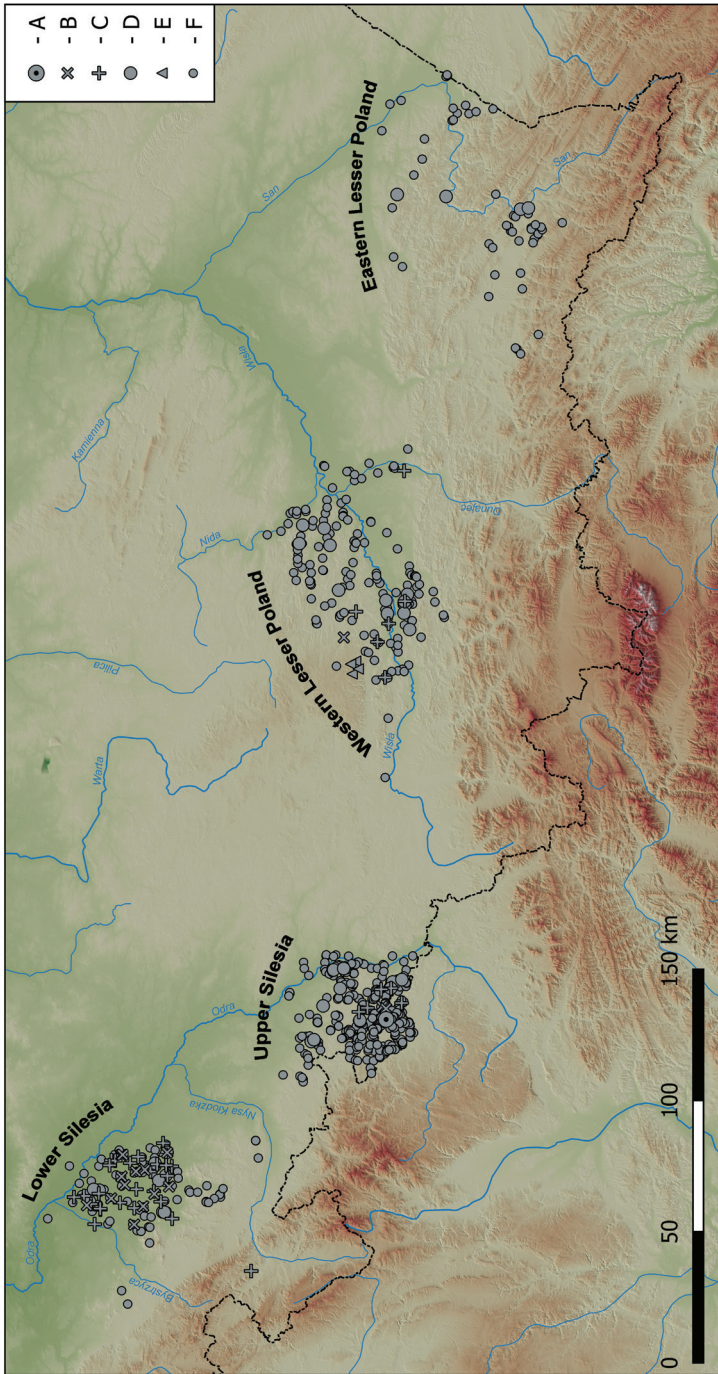


FIG. 1. La Tène culture settlement within the boundaries of modern Poland. A – emporium. B – cemetery. C – single grave. D – settlement (objects identified during excavations). E – cave site. F – Settlement trace (prepared by P. Dulęba)

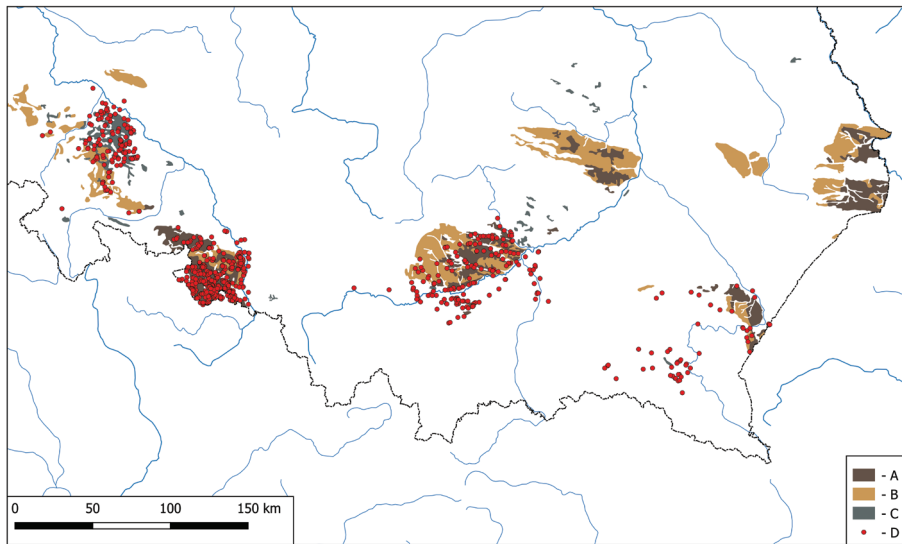


FIG. 2. The most fertile soils in the area of southern Poland and the distribution of La Tène culture settlements. A – chernozem. B - brown soils formed from loess. C – “black earths”. D – La Tène culture sites (based on: Dobrzański 1972, prepared by P. Dulęba)

(Dziągiewski *et al.* 2011, 316, fig. 2; Dulęba *et al.* 2020, 290, fig. 2) as well as survey supported by geophysical prospection (Dulęba *et al.* 2015), that they were somewhat larger, “stretched” settlements consisting of two, three or more farmsteads with a gap of several tens of metres between them, which formed a kind of “network”. Settlement performed in almost all Iron Age cultures recorded in southern Poland is located mainly on low terraces in the valleys of small watercourses or on high terraces in the valleys of large rivers. Preference was given to indented promontories or valley edges bounded on at least two sides by watercourses. Traces of the settlement in highland areas are extremely rare in the area in question during the late La Tène period, but such sites are known from eastern Lesser Poland (Karwowski 2007, 132–134), unfortunately still very poorly recognised.

Lower Silesia

The La Tène culture of Lower Silesia is known primarily for its sepulchral finds (Jahn 1931). Settlement sites in Lower Silesia are still studied to a small extent, but recently the first larger series of materials from settlements, mostly studied

on a small scale, have become available (Górzec, Kurzątkowice, Pożarzyce, Radzików, Śleza, Wiązów and Wrocław-Partynice). The general lack of information on settlement sites from this area is influenced by the poor identifiability of mass materials, which should be dated mostly to the early La Tène period and the beginning of the middle La Tène period. In Lower Silesia, 125 sites with La Tène culture materials have been registered (as of 2019), 38 of which are remains of single burials and small cemeteries. The aforementioned sites constitute a compact cluster with an area of approximately 1 500 km².

Upper Silesia

The enclave of the La Tène culture in Upper Silesia is by far the most intensively populated area in modern Poland. Celtic settlers, starting from the LT B1b phase, occupied the northern foreground of the Moravian Gate, from where it was very easy to control the most important north-south communication route in this part of Europe, functioning already several centuries before the Celts (Bochnak, Goláňová 2010). There are few sepulchral finds from this region (at least 9 sites), but we know of more than 400 settlement sites in a compact cluster covering an area of approx. 2 000 km², including at least several studied on a larger scale (Roszowicki Las, Łany, Sułków). The relatively largest number of new data concerning Celtic settlements comes from the currently studied microregion in the vicinity of Samborowice, Racibórz district (Fig. 3-6). In the centre of the Upper Silesian enclave of Celtic settlement there is a large settlement at Nowa Cerekwia, Głubczyce district, which is the only site known so far from the area north of the Carpathians and Sudetes with the character of a central crafts and trade agglomeration (Rudnicki 2014). The period of its functioning should be dated between LT B2-C2 phases.

Western Lesser Poland

More than 170 sites of La Tène culture are known from the area of contemporary western Lesser Poland, located in an area of 3 300 km². Most of them come from the area of fertile loess highlands located on the left bank of the Vistula river. Despite the fact that the Celtic settlement here is of an extremely extensive character, the greatest number of sites with a relatively large number of features with a precisely established chronology originate from the area of western Lesser Poland (in this group we should first of all distinguish the settlements in Dalewice, Kraków-Wyciąże, Pełczyska, Podłęże, Zagórze and

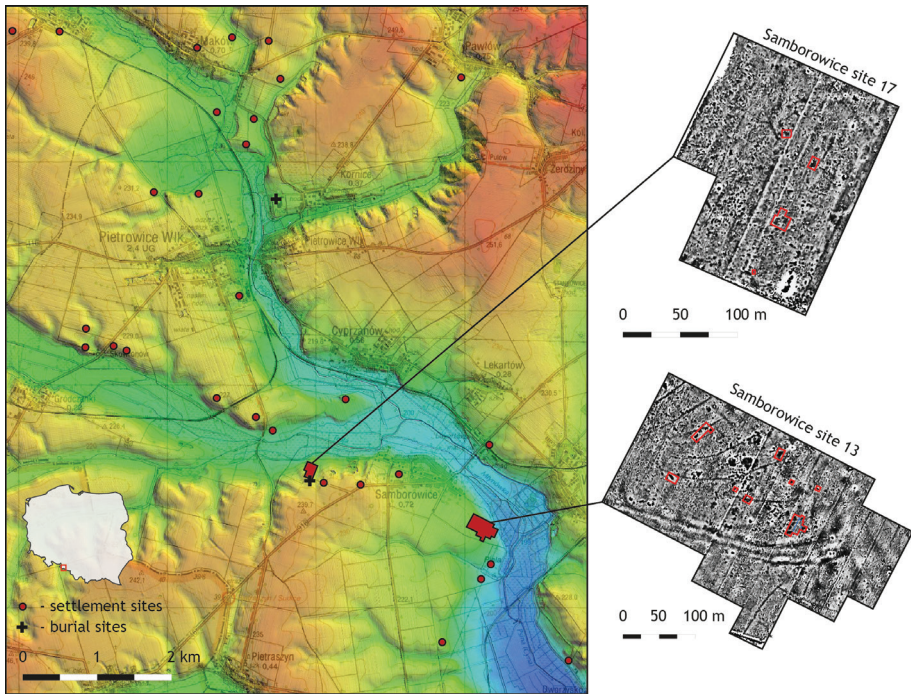


FIG. 3. A – La Tène culture sites in the microregion of Psina and Troja valleys. B – Results of magnetometric prospection on site 17 with research excavations marked from seasons 2016-2019. C – Results of magnetometric prospection on site 13 with research excavations marked from seasons 2013-2020 (Map P. Dulęba, J. Soida, P. Wroniecki)

Zagórzyce), which constitute a good basis for distinguishing particular settlement phases. Grave finds occur here sporadically and are known only from 7 sites, which is mainly due to the chronology of the local Celtic settlement, which began at the turn of the early and middle Latin periods. The last horizon of Celtic burials from the Polish lands is dated to the LT C1 phase, which is connected to the general trend observed in the whole area of Central Europe, where starting from the LT C2 phase a drastic change of the funerary ritual is visible and the disappearance of previously functioning cemeteries is connected with it.



FIG. 4. A – Excavations at site 13 in Samborowice. Excavation 1/17 (photo by J. Soida).
B – Cleaning the negative of feature 71 at site 13 in Samborowice (photo by J. Soida)



FIG. 5. A – Excavations at site 17 in Samborowice. Excavation trench no. 1/19 (photo by Jacek Soida). B – Profile of feature 84 on site 13 (photo by J. Soida)



FIG. 6. A – A fragment of a cattle skeleton in the bottom part of the fill of feature 1 at site 17 (photo by Jacek Soida). B – A fragment of a deer antler in the fill of feature 15 on site 17 (photo by J. Soida)

Eastern Lesser Poland

The enclave of La Tène culture settlement located in the eastern part of present-day Lesser Poland is poorly explored. Within a relatively large area of approximately 3 400 km² only more than 50 sites with La Tène material have been located, which are grouped in at least three distinct and clearly separated clusters. Only on four sites (Bachórz, Lipnik, Sanok-Biała Góra and Sanok, site no. 59-60)¹ were remains of features discovered, which can be evidently interpreted as the La Tène culture settlement's relics. In the area of eastern Lesser Poland no reliable burials of the La Tène culture have been discovered so far, which may also result from the relatively late appearance of new settlers. On the basis of the artefacts discovered so far, the local Celtic settlement can only be dated to the middle La Tène period (Karwowski 2004). At present, we do not have any finds which can unequivocally extend the period of the local communities of the La Tène culture. A distinctive feature of the eastern Lesser Poland enclave of Celtic settlement is its connection with the centres of La Tène culture functioning in the area of the Carpathian Basin, but at this *par excellence* initial stage of research it is difficult to indicate unequivocally which direction of influence prevailed.

III. CHRONOLOGY OF LOCAL SETTLEMENT AND THE RHYTHM OF CULTURAL CHANGE

The beginning of the settlement of the La Tène culture in the Polish territory should be associated with the LT B1 phase, while its oldest stage – so called pre-Duchcov horizon (phase LT B1a) – is captured only in the form of a small number of burials from the Lower Silesian area (Dulęba 2019a). The larger series of finds are dated to four successive stages (B1b, B1c, B2a, B2b – according to the chronological system by R. Gebhard 1989). However, these are grave finds in the overwhelming majority. Data on settlement sites from the whole

1 Other examples of settlement features mentioned in earlier literature (compare Bochnak 2019, 31, Fig. 1 and list of finds) are difficult to date due to the very small number of pottery with distinctive attributes which can be *unambiguously* assigned to the La Tène culture. The presence of Celtic pottery, which was secondary deposited in chronologically younger features, is an additional phenomenon that hinders the correct dating of these sparse finds.

of the early La Tène period is still scarce, nevertheless even the modest series of these is clearly different from the settlement finds from the middle La Tène period (Duleba 2019b). The middle La Tène period, especially its initial stages (LT C1a, C1b), is the time of the greatest prosperity for the local population of the La Tène culture. It was at that time when it reached the apogee of its development and had a vast impact on the neighbouring communities of the Germanic cultural circle to the north. The overwhelming majority of finds of La Tène culture from the Lesser Poland and Silesia date to the middle La Tène period (Duleba 2014; 2019b). The settlement of the La Tène culture in the area of present-day Poland ceased at the end of the middle La Tène period. Lower Silesia was first settled by small groups of settlers of the Jastorf culture and then by the community of the Przeworsk culture. Upper Silesia remained unsettled until the Roman period. It is difficult to state unequivocally what the development of local settlement in the eastern Lesser Poland area looked like, but it seems that in the late La Tène period there are only few traces of settlements of the Przeworsk culture (Kokowski 2001, 111–112, table II). On the territory previously occupied by the representatives of the La Tène culture in the area of western Lesser Poland, at the beginning of the late La Tène period a numerous community of the Przeworsk culture arrived, which together with a new, small group of Celtic settlers originating from the Carpathian Basin, formed the Tyniec group – a specific cultural group of a syncretic character, which existed in the area of present-day Kraków until the beginning of the Roman period (Duleba 2009, 23–27; the history of research and an overview of contrary views on this subject: Bochnak, Dzięgielewski 2020).

The beginning of the middle La Tène period was a major turning point in the development of the La Tène culture in Central Europe. It was at this time that the vast territory occupied by Celtic settlement saw the widespread adoption of new advances in civilisation (e.g. minting, glass processing, mass production of workshop pottery and iron objects, the manufacture of high-quality weapons), which in later periods are so clearly associated with the Celts. It is at this time that the greatest flourishing of the various size (Trebsche 2014, 342–347), local craft and trade agglomerations (Militký, Venclová 2014, 387–389, fig. 1), which were later replaced by oppida. Until recently, the issue of the rapid economic development of the La Tène culture in Central Europe was mainly associated with the long researched and fairly well recognised oppida (cf. Filip 1956, 315–328; Collis 1984; Drda, Rybová 1998, 127–168), which provided a relatively large number of finds enabling the reconstruction of economic relations which prevailed during the functioning of these centres. On

the territory of modern Poland the settlement of the La Tène culture disappears before the beginning of the late La Tène period, which is the time of the greatest flourishing of oppida. The Tyniec group and a few sites of the Púchov culture are the only cultural units genetically related to the late La Tène culture existing in the discussed area, but, what is worth emphasising, there is no sufficient evidence of their direct connection with the earlier Celtic settlement. These were syncretic (most likely multi-ethnic) groups, so not all aspects of the material or symbolic culture of the taxonomic units mentioned are suitable for comparison.

IV. CHARACTERISTICS OF ZOOLOGICAL SOURCES FROM CELTIC SETTLEMENTS IN POLAND

Publications concerning the La Tène culture settlements developing in our lands so far are lacking a synthetic attempt to evaluate the breeding economy of the Celtic tribes which arrived in our lands. Certainly, one of the basic reasons for this state of affairs is, on the one hand, the rather scarce bone material obtained during research, and on the other, the lack, or incomplete archaeozoological analyses. However, in spite of the still scarce and often incomplete data, an attempt was made to evaluate consumption patterns in areas with La Tène settlement.

The analysis included sites for which archaeozoological data were available from three regions: Lower Silesia, Upper Silesia and western Lesser Poland. The selected sites were rural-type settlements, except for one case – Nowa Cerekwia, which was a craft and trade agglomeration. For comparative purposes only post-consumer waste remains were used. The osteological material was subjected to standard analysis taking into account species composition and anatomical² including the topographical distribution of carcasses into valuable and low-value parts, the age and morphology of the animals. The latter trait was evaluated on the basis of a calculated height at withers and, in case of cattle and pigs, also on a point scale³ (Lasota-Moskalewska

2 The skeletal remains of a sheep and a goat were treated together.

3 The point scale, where the lowest dimension of a trait is 0 and the highest is 100, is divided into 3 categories: 30 points correspond to small-sized individuals, 31 to 70 points to medium-sized individuals, 71 to 100 points to large-sized individuals.

1984; Lasota-Moskalewska *et al.* 1987). For comparative data, carcass distribution was assessed using the scheme by D. Makowiecki⁴ (Makowiecki 1998), and age of animals using the division by E. J. Reitz and E. S. Wing⁵ (Reitz, Wing 2001).

Lower Silesia

Sites with Celtic objects from Lower Silesia that provided bone material are: Kurzątkowice, Oława district, site 1, dated as LT B1–B2 (Dulęba, Kosicki 2017; Chrzanowska 1998); Ślęza site no. 11-12, Wrocław district, dated as LT B2–C1 (Dulęba 2019b; Chrzanowska, Krupska 1999); Wrocław-Partynice, site 6, dated as LT B2–C1 (Dulęba 2019b; Abłamowicz 2019a) and Górzec, Strzelin district, site 13, dated as LT C1 (Chrószcz *et al.* 2014) (Table 2).

Kurzątkowice is a small settlement, and the sites discovered there were dated to the LT B1–B2 phases. The bone material of 116 remains represented mammals (97.4%) and birds (2.6%) and came from two features: a pit-house of a craftsman (feature no. 1/90) and a pit of undefined function (feature 1/93). Among the mammals, exclusively domestic, the skeletal elements of a pig (41.6%) predominated, followed by cattle (37.2%) and sheep/goat (16.8%). Horse (2.6%) and dog (1.8%) had a minimum share. Birds were represented by the hen. Anatomically, the bones of the four main consumptive species (pig, cattle, sheep, goat) represented practically all sections of the skeleton. For these animals, there was a slight predominance of consumptive carcass sections, among which ribs and pelvic limb bones accounted for the largest share. In case of pig and cattle, and thoracic limb bones for sheep/goat. No data were

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- 4 Topographical carcass classification: Class I - Less valuable parts and slaughterhouse waste: subclass A - bones of the head (proboscis, antlers, cranial bones, mandible, teeth, hyoid bone), subclass B - bones of the hand and foot (carpal bones, metacarpal bones, tarsal bones, metatarsal bones, toe caps and pinnae). Class II - Consumable parts of the carcass: Subclass A - spinal bones (cervical vertebrae, thoracic vertebrae, lumbar vertebrae, sacrum, coccyx), Subclass B - ribs (ribs), Subclass C - bones of the thoracic limb (scapula, humerus, radius bone, ulna), Subclass D - bones of the pelvic limb (pelvic bone, femur, patella, tibia, fibula).
- 5 Age of animals: young animals (*juvenis*), overgrown animals (*subadultus*), grown animals (*adultus*). Cattle - *juvenis*: below 10 months, *subadultus*: 10-24 months, *adultus*: over 24 months; pig - *juvenis*: below 12 months, *subadultus*: 12-16 months, *adultus*: over 16 months; sheep/goat - *juvenis*: below 12 months, *subadultus*: 12-18 months, *adultus*: over 18 months.

TABLE 2. Species composition of animal remains in sediments from Lower and Upper Silesia and western Lesser Poland

Region/site	Chronology	Global number of bones/number of marked bones	Cattle %	Pig %	Sheep/goat %	Horse %	Dog %	Cat %	Domestic animals %	Deer %	Roe deer %	Boar %	Aurochs %	Bear %	Beaver %	Otter %	Fox %	Rodent %	Wild animals %	Birds %	Invertebrates %	
Lower Silesia																						
Kuizątkowice 1	B1-B2	113/113	37.2	41.6	16.8	2.6	1.8	-	100	-	-	-	-	-	-	-	-	-	-	2.6	-	
Ślęza 11- 12	B2-C1	76/76	60.5	21.1	5.2	13.2	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	
Wrocław-Partynice 6	B2-C1	26/25	68.0	8.0	-	-	24.0	-	100	-	-	-	-	-	-	-	-	-	-	-	-	
Górzec	C1	143/85	52.9	16.5	17.6	1.2	9.4	-	97.6	-	-	-	-	-	-	-	-	2.4	2.4	2.3	1.1	
Upper Silesia																						
Nowa Cerekwica 4	B2-C2	9710/ 8673	34.5	29.6	29.8	3.8	1.7	-	99.4	0.2	0.1	0.1	0.1	-	-	0.02	0.07	0.01	0.6	0.2	-	
Samborowice 13	B2-C2	395/282	70.6	10.6	13.1	3.2	0.3	-	97.8	1.1	-	-	-	-	1.1	-	-	-	2.2	-	-	
Samborowice 17	C1-C2	902/702	38.0	26.0	30.5	0.5	2.4	-	97.4	2.0	0.3	-	-	-	-	-	-	0.3	2.6	2.1	-	
Western Lesser Poland																						
Dalewice 1	C1-C2	242/204	55.4	23.5	16.6	2.5	1.5	-	99.5	-	-	-	-	-	-	-	-	-	0.5	0.5	-	-
Zagórze 2	C1-C2	1428/777	50.1	19.5	21.9	2.9	2.9	-	97.3	1.0	0.8	0.5	0.4	-	-	-	-	-	2.7	-	-	-
Zagórzycze 1	C1-C2	356/229	32.3	23.2	38.0	2.6	1.3	0.9	98.3	-	0.4	-	-	0.4	-	-	-	0.9	1.7	0.9	-	-

available in the archaeozoological analysis regarding the age of slaughter and the morphology of the livestock.

The bone material from Ślęza comes from a pit-house (feature 155) and from a pit, which presumably was a form of a cellar (feature 150) connected with a post-structure. A total of 76 elements representing domestic animals were recovered. Bones of cattle came first (60.5%), followed by those of a pig (21.1%), a horse (13.2%), and a sheep/goat (5.2%). Anatomically, only cattle and pig represented practically all sections of the skeleton. For these species, there was a predominance of consumable carcass parts with a predominance of thoracic limb bones. In case of horse and sheep/goat, only small-valued parts of the carcass were present – head bones and bones of the hand and foot. No data were available in the archaeozoological analysis regarding the age of slaughter and morphology of livestock.

In Wrocław-Partynice, animal bones were found in a pit-house (feature 26) and a pit (feature 23). Only 26 fragments were recovered, and 25 were identified as belonging to domestic mammals: cattle (68%), dog (24%) and pig (8.0%). The age of cattle was determined as 7-10 years (*adultus*), of pigs as 6-10 months (*juvenis*) and of dogs as 8-10 years (*adultus*). The height at withers of cattle from site 26 was 111.6 cm (medium-sized individual). Due to the low turnout, this collection served only as supplementary material.

In the settlement discovered in Górzec, the bone material consisted of 143 remains, of which 88 fragments were identified (Chrószcz *et al.* 2014, 71–124). These represented mammals (96.6%), birds (2.3%) and invertebrates (1.1%) and came from the semi-dormitory (feature 27). Among the mammals, domestic animals dominated (97.6%), with cattle being the most numerous in this group (52.9%), followed by sheep/goat (17.6%) and pig (16.5%). Dog bones accounted for 9.4% and horse bones for 1.2%. Wild animals (2.4%) were represented by a rodent – edible dormouse. Among the marked bird remains a mallard duck was identified. The identified invertebrate fragment belonged to a duck mussel. In terms of anatomy, only in case of cattle practically all skeletal sections were present. For this species, more parts of the less valuable carcass were recorded with the largest share of head bones, while among the valuable elements, the largest share was of trunk elements. Similarly, in case of pigs, the proportion of less valuable parts (head bones) was significant and amounted to 85.6%. Only the distribution of sheep/goat bones indicated a slight predominance of valuable parts, mainly ribs. The data obtained on the age of cattle showed that mainly *adultus* animals were driven for slaughter, nearly 70%, and to a lesser extent mature *subadultus* animals, while no

juvenis animals were recorded. Similarly, for small ruminants, the majority of animals slaughtered were *adultus* (62.5%), with the remaining percentage belonging to *juvenis* and *subadultus* animals. The pig was most often slaughtered as *adultus* (55.5%) and *juvenis* (33%). The age of the dogs was estimated to be above 8 months. The calculated and averaged height at withers for cattle (female or steer) was 113.8 cm (medium-sized individual).

Upper Silesia

Sites from Upper Silesia are: Nowa Cerekwia, site 4, Głubczyce district, dated to LT B2–C2 (Czerska 1963), Samborowice, Racibórz district, site 13, dated LT B2–C2 and site 17, dated to LT C1–C2 (Abłamowicz 2019b, 2019c; Dulęba *et al.* 2021) (Table 2).

Nowa Cerekwia settlement has so far yielded the largest number of animal remains, around 9,710, of which 8,688 fragments have been identified (Czerska 1963, 300–301), excavated from five typical pit-houses (features 5, 6, 8, 11, 12), the so-called groove feature connected with a grave enclosure (feature 3), two storage pits (features 4 and 10) and two pits of undetermined function (features 7 and 9). Mammals predominated (99.8%) over birds, which were also identified (0.2%). Among mammals, domestic ones dominated (99.4%), and only a small fraction of a percent belonged to wild ones (0.6%). Among the livestock, cattle came first (34.5%), followed by sheep/goats (29.8%), pigs (29.6%) in third place, followed by horse (3.8%) and dog (1.7%). Free-living mammals were represented by deer, bison or aurochs, wild boar, roe deer, fox, otter and squirrel. The marked bird bones belonged to hens and geese. Cattle and goats were mainly slaughtered as adults (*adultus*), pigs were usually killed between the ages of 18 and 26 months (*adultus*). Sheep were usually slaughtered between the ages of 18 months and 2 years (*subadultus/adultus*). The cattle herd consisted of medium-sized animals, the pig herd of large animals and the small ruminant herd consisted of medium-sized and tall animals. No data on anatomical composition were available in the analysis.

On site no. 13 in Samborowice animal bones came from eight pit-houses (features no. 40, 71, 84, 85, 113, 128, 132, 134). A total of 395 fragments were excavated, of which 282 belonged exclusively to mammals. Farmed animals (97.8%) outnumbered wild ones (2.2%). The first group was dominated by cattle (70.6%), followed by sheep and goats (13.1%) and pigs (10.6%). The share of horse and dog bones was insignificant (3.2% and 0.3% respectively). Wild mammals were represented by deer and European beaver. In terms of anatomy,

only in case of cattle and sheep/goat practically all bone sections were present. For the four basic breeding species – cattle, sheep, goat, pig – there was a slight predominance of low-value parts, among which the largest share was accounted for by bones of the head. On the other hand, among the valuable elements, the highest proportion had the bones of the thoracic limb (cattle, sheep/goat) and pelvic limb (pig). The age data obtained show that, in case of the aforementioned species, mainly adult animals of *adultus* age were slaughtered, and to a lesser extent *subadultus* animals; no *juvenis* animals were recorded. The height at withers of the cattle obtained ranged from 97.0 to 115.3 cm and, taking bone measurements into account, it can be concluded that the herd consisted of low- and medium-sized animals. The calculated height at withers for a single sheep was 56.7 cm.

From four pit-houses (features no. 1, 13, 14, 15) discovered on site no. 17 in Samborowice, 902 bones were excavated, 717 of which were identified. They belonged to mammals (97.9%) and birds (2.1%). In the first group, domestic (97.4%) and wild animals (2.6%) were identified. Among the farmed ones, cattle (38.0%) ranked first, sheep and goats second (30.5%) and pigs third (26.0%). The share of horse and dog was insignificant (0.5% and 2.4% respectively). Free-living animals were represented by deer and roe deer. Also rodent bones the size of a field mouse were distinguished, which should rather be regarded as a secondary admixture. The marked birds belonged to domestic (hen) and wild (mallard duck, goose, black grouse, buzzard, crane). Anatomically, the primary breeding species represented practically all sections of the skeleton. For cattle and sheep/goat, there was a slight predominance of valuable carcass parts over less valuable parts. For cattle, the highest percentages were for trunk and thoracic limb bones, and for sheep/goat for thoracic and pelvic limb bones. For pigs, there was a predominance of low-value parts (mainly head bones), while among the valuable elements, the highest percentages were for bones of the fore and hind limbs. In case of cattle and pigs, almost exclusively adult animals (*adultus*) were sent for slaughter, while in case of sheep and goats the proportion of adult animals (*adultus*) and young and overgrown animals (*juvenis*, *subadultus*) was balanced. In a single case, the age of a dog was determined to be about 8 years and of a horse about 20 years. The calculated height at withers of cattle, either females or steers, ranged from 102.3/104.8 cm to 105.7/108.7 cm, so these values, as well as the bone measurements, indicate a herd composed of low- and medium-sized animals. The height of a single individual pig was 65.3 cm. Taking into account also the bone measurements of this species, it can be concluded that the flock consisted in the vast majority

of medium and large individuals. The height at withers for sheep ranged from 59.6-60.1 cm (medium-sized animals).

Western Lesser Poland

Sites in western Lesser Poland are as follows: Dalewice, site 1, Proszowice district, dated to LT C1-C2 (Abłamowicz 2020), Zagórze, site 2, Wieliczka district, dated to LT C1-C2 (Dulęba *et al.* 2012; Makowicz-Poliszot 2016) and Zagórzycze, site 1, Kazimierza Wielka district, dated to LT C1-C2 (Gocman, Pieńkos 2012) (Table 2).

In the Dalewice site, 242 bones were excavated from six pit-houses (features no. 1, 36, 39, 40, 42, 56) and two pits (features no. 35 and 62), of which 204 were identified as belonging exclusively to domestic mammals (99.5%) with the exception of a single rodent fragment (0.5%), which may have been a secondary admixture. Among the domestic mammals, cattle were the most numerous (55.4%), followed by pigs (23.5%), sheep and goats (16.6%), horse (2.5%) and dog (1.5%). In terms of anatomy, the main domestic mammals – cattle, pig, sheep and goat – were represented by virtually all sections of the skeleton. In case of cattle, there was a predominance of the bones of the less valuable parts of the carcass with a clear dominance of the bones of the head, while among the valuable elements, the bones of the trunk and thoracic limb had the highest proportion. In case of pigs, the proportion of low-value and valuable parts was balanced, with head bones predominating in the former group and pelvic limb bones in the latter. As far as sheep/goats are concerned, a predominance of valuable carcass parts was found, with breastbone accounting for the largest share. In case of cattle, mainly *adultus* animals were intended for slaughter, much less in the *subadultus* age group, and adult pigs were also the most frequently sent for slaughter (more than 70%), with fewer in the *juvenis* (more than 10%) or *subadultus* age groups (more than 10%). The age specified for small ruminants was 4-8 months in the *juvenis* group and 2-3 years in the *adultus* group. The calculated height at withers for the cattle ranged from 93.0 cm to 116.4 cm. Considering these data and the bone measurements, it must be concluded that the herd consisted of low and middle aged individuals.

1,428 bone fragments come from the settlement in Zagórze (Makowicz-Poliszot 2016, 24-25). These were identified in 21 features: seven pit-houses (features no. 1539, 1663, 2484, 2560, 3045, 3294, 3314), the rest were pits of unspecified functions. The 777 marked bones belonged exclusively to mammals, both domestic (97.3%) and wild (2.7%). Among the domestic ones, cattle

bones were found the most (50.1%), followed by sheep and goat (21.9%) and pig (19.5%). The share of horse and dog was the same at the level of 2.9% per each. Free-living animals were represented by deer, roe deer, wild boar and aurochs. The bones of the main livestock species belong to almost all skeletal elements. With regard to cattle, there is a predominance of valuable parts, among which the largest proportion is accounted for by elements of the trunk; similarly, in case of sheep and goats, valuable parts predominate, with the largest proportions accounted for by bones of the trunk and pelvic limb. The bone material of the pig shows a predominance of low-grade parts, especially bones of the head, while the valuable parts are dominated by bones of the thoracic limb. The analysis of the remains of cattle in terms of their age indicates a clear predominance of *adultus* animals (over 70%), *subadultus* age was about 16% and *juvenis* over 11%. With regard to sheep and goats and pigs, the percentages of individuals at the *adultus* age are also the highest, but do not exceed 50%. The proportion of mature and juvenile animals in these species was respectively: 37.5% and 21.6% and 17.5% and 28.9%. The bones of the horse came from mature individuals and those of the dog from mature, nearly mature and young individuals. The height at withers for cattle ranged from 96.1 to 111.6 cm and corresponds to small-sized and medium-sized animals. On the other hand, the values obtained for the pig of 72.7 cm and 79.3 cm indicate medium-size and large-size animals.

In Zagórze, the number of remains retrieved was 356 (Gocman, Pieńkos 2012, table 1). They came from four pit-houses (features 9, 21, 100, 246) and a pit of undetermined function (feature 276). 231 identified bones belonged to mammals (99.1%) and birds (0.9%). Among the first group, farmed animals (98.3%) definitely dominated over wild ones (1.7%). Sheep and goats were first (38.0%), cattle second (32.3%) and pig third (23.2%). Horse (2.6%), dog (1.3%) and cat (0.9%) were also identified. The marked wildlife bones belonged to deer, roe deer and rodent. Bird bones have not been identified to species. Bones of farmed mammals belong to almost all skeletal elements. In all cases, a predominance of valuable parts can be observed, among which the thoracic limb bones (cattle), trunk elements (sheep/goat), pelvic limb bones (pig) have the largest share. Analysis of the slaughter age of the four main breeding species – sheep, goats, cattle, pigs – showed that mainly *adultus* specimens, after reaching morphological maturity, were destined for consumption, 94.3% (sheep, goats), 98.7% (cattle), 84.9% (pigs), respectively. Bone measurements of cattle indicate the presence of low- and middle-sized animals. The calculated height at withers for sheep – 63.5 cm indicates an individual of medium height.

Summary

Based on the archaeozoological data obtained, it can be concluded that the basis of the livestock economy of communities inhabiting the three regions of Lower Silesia, Upper Silesia and western Lesser Poland in the La Tène period was very similar. For the population groups studied, the basic group providing meat food were four species of domestic mammals: cattle, pigs, sheep and goats. Horses and dogs, on the other hand, do not seem to have been of major importance in consumption. However, the relatively high proportion of horse (13.2%) at the site in Ślęza in the Lower Silesia region should be emphasised, but the small number of bones recovered from this site may cause that this sample should be treated as insignificant. The main meat reservoir in all tested areas was probably cattle, which occupied by far the first place in all studied settlements. Deviations in this respect were recorded only at two sites: at Kurzątkowice and at Zagórzyce. In the former, pig bones came before cattle in terms of abundance, the difference between them being 4.4%. On the second site, sheep/goat bones dominated before cattle and the difference in this case was 5.7%. However, certain noticeable differences between the studied areas concern animals playing a secondary role in the provision of meat, namely pigs and small ruminants. In Lower Silesia, pork seems to have been consumed more readily than mutton and goat meat, while in Upper Silesia meat from small ruminants was much preferred to that from pigs. The data obtained in this respect from the area of western Lesser Poland are not unequivocal (once sheep/goat comes second and pig third (Zagórze), or conversely, pig comes second and sheep/goat third (Dalewice). Hunting played a minor role in the economic activities of the analysed communities. The smallest number of wild animal bones was recorded in the Lower Silesia region, where they occurred only in the Górzec site, and their share amounted to 2.4%. In the remaining two regions, they were recorded on almost all sites, but their share did not exceed 3% of the total collection. This fact appears to be linked to the intensification of agriculture, the expansion of cultivation and the consequent reduction in the living space for game, as well as to the lack of a sufficiently large social stratum interested in game consumption. Similarly, poultry meat was not popular in any of the regions. Single chicken bones were recorded only at the site in Kurzątkowice and hens and geese at Nowa Cerekwia and Samborowice, site 17. Wild fowl were recorded at two sites in Górzec and Samborowice, site 17.

In all areas, the observations concerning the anatomical distribution, with reference to the division into valuable and low-value carcass parts, of the basic

breeding species indicate a preference for consuming mainly the former. In terms of cattle, these were usually parts of the torso (parts of the carcass now distinguished as neck, neck, loin, brisket, brisket, striploin, roast beef), or parts associated with the proximal segments of the foreleg (shoulder, fore shank). In case of pigs, the proximal sections of the pelvic limb (rump, ham, hind shank) were found most frequently, while those of the thoracic limb (shoulder, fore shank) were found slightly less frequently. In case of sheep and goats, on the other hand, the most numerous were the proximal parts of the thoracic limb (back, fore shank), and less frequent – the bones of the torso (neck, neck, breastbone, brisket, loin). A significant consumption of valuable parts of the carcass may indicate a large number of herds in relation to the population of settlements, which ensured an abundance of meat and allowed for more sophisticated culinary tastes. The predominance of low-value carcasses was recorded much less frequently; usually it concerned a single species in a given locality (pig: Samborowice 17, Zagórze) or two (cattle and pig: Górzec; Dalewice). Only in a single case, at site 13 in Samborowice, was a predominance of low-value batches recorded for all farmed species. At the mentioned settlements, the overwhelming majority of the consumed meat in this group was head. In case of pigs, this may have been due to the meticulous use of this part for culinary purposes due to its source of very tender meat, often treated as a delicacy. This is due to the composition of the pig, virtually the entire carcass of which is suitable for consumption (Sobociński 1977). It should be added, however, that the considerable fragmentation of the head skeleton, especially in the other species, may have been due to taphonomic factors, which, together with the high distinctiveness of the cranial fragments, may have resulted in an overrepresentation of bony elements of the head (Makowiecki 2008).

Analysis of the remains of basic farm animals in terms of age indicates a clear domination of adult and mature animals in the studied areas. In case of cattle at the sites in Lower and Upper Silesia, it was found that mainly animals over 24 months of age (*adultus*) and 10-24 months of age (*subadultus*) were sent for slaughter; only in the settlements in Zagórze and Zagórzycze (western Lesser Poland) were young animals under 10 months of age (*juvenis*) sent for slaughter. This testifies to the fact that this species was bred not only for meat, but also to obtain by-products such as milk (and its products), fertiliser and used as a workforce. Bone lesions considered to be indicators of trainability (Bartosiewicz 1997) was confirmed at the settlement in Nowa Cerekwia and at sites no. 13 and 17 in Samborowice (Figs. 7-8). With respect to pigs, there was also a high proportion of adult animals slaughtered, over 16 months of



FIG. 7. Samborowice, site 13. Closer pastern of cattle with degenerative changes due to harness work (photo by J. Soida)



FIG. 8. Samborowice, site 17. Metacarpal bone of bovine animals with degenerative changes (distal end including shaft region) due to harness work (photo by J. Soida)

age (*adultus*), while it was less common for young animals, under 12 months of age (*juvenis*) or 12-16 months of age (*subadultus*) to be slaughtered. A one-year-old pig already reaches 95% of its adult body weight, so it was also profitable to kill it before it reached morphological maturity. In case of small ruminants, also in all areas mainly adult animals over 18 months of age (*adultus*) were recorded, which allows us to assume that the primary use of this group of animals was to obtain milk and wool. Young animals under 12 months old (*juvenis*) and those between 12 and 18 months old (*subadultus*) were also slaughtered, although much less frequently, and their meat is considered to be much better than that of older animals (Załużska 1985).

The cattle kept by the communities of Lower and Upper Silesia and western Lesser Poland consisted of low- and middle-sized specimens representing the short-horned type: *Bos taurus brachyceros* (Lasota-Moskalewska 2005). The pigs were of the medium and large size variety and the small ruminant herds consisted mainly of medium-sized specimens.

It should be stressed that the presented results are the effect of preliminary research and that the data obtained in most cases, due to the small number of remains, are only indicative. Undoubtedly, further research, taking into account a larger number of data, will be more comprehensive and will perhaps provide more precise answers to more questions. It is possible that the already visible trends will also be confirmed in analyses conducted on a larger number of sites.

V. CHARACTERISTICS OF ARCHAEOBOTANICAL REFERENCES

The current state of research on the plant economy of the community of the La Tène culture inhabiting the discussed area, which translates into the amount of information available, is not satisfactory at present. Relating the number of archaeobotanical sites to the total number of archaeological sites mentioned in this study (over 700), the amount of archaeobotanical data seems to be very scanty. Indeed, it concerns only a few sites. Voices about the need for research on this period in the context of plant economy have been appearing in the literature on the subject for many years (Klichowska 1961; Lityńska-Zajac 1997a; Rodzińska-Nowak 2012, 98–99). Apart from the small number of archaeobotanically surveyed sites from the La Tène period, some publications only provide information on the species found on a site without giving the number of remains or their state of preservation, which is a prerequisite for the correct interpretation of these finds. The available information does not provide data

on the nature of the site and its proximal chronology or the relationship of plant materials to the archaeological context. For some sites there are problems with plant nomenclature, and access to original botanical studies can be problematic (Lityńska-Zajac 1997a). All these ambiguities significantly limit the database on plants late of the La Tène period for the time being, and the comparison of such “ragged” information is a major problem when it comes to obtaining a complete, reliable archaeobotanical compilation.

The archaeological research carried out at sites no. 13 and 17 in Samborowice provided new and thus valuable information on cultivated and wild plants and contributed to the knowledge of plant economy of Celtic communities inhabiting the area of today’s south-western Poland. The information obtained as a result of systematic archaeobotanical research accompanying the archaeological works at Samborowice is probably the richest set of plant remains from sites chronologically related to the La Tène culture in Silesia (Sady 2018, 2019; Sady-Bugajska 2019, 2020a, 2020b, 2020c, 2020d, 2021). The research on plant remains carried out for the La Tène culture settlements at Samborowice was primarily aimed at understanding the assortment of cereals that was available to the communities living there, and at determining whether the significant cultural changes attributed to the Celtic tribes also manifested themselves in the context of plant economy. An answer to this question is only possible through a very detailed analysis of the plant remains preserved on the mentioned and analogous archaeological sites. Unfortunately, no large cereal deposit or dense and numerous set of remains with a clearly defined archaeological context has been found so far, which could be used for a precise analysis of cultivation structures. Despite these inconveniences, however, an attempt has been made to assess the role of particular cereal species in the economy of Celtic tribes living in the vicinity of contemporary Samborowice based on the results obtained. For the sites in Samborowice we have a set of plant remains, which were obtained by analysing the fillings of various objects. The samples were taken from pit-houses, pits and postholes. Thus, in this case we are talking about dispersed remains, whose presence in a given layer or object may result either from intentional human activities, or from their accidental introduction, i.e. the presence of plant remains was not clearly defined by the archaeological context (Lityńska-Zajac, Wasylkowa 2005, 451). Despite this fact, systematic sampling during fieldwork from the majority of the discovered features yielded a rich list of species, which undoubtedly constitutes an important source of information and a contribution to the knowledge of the economy of the settlers living in Samborowice during

the La Tène period. In few cases, it was possible to capture the imprints of various plants in the field or even in the admixture of ceramic vessels (Fig. 9).

The plant remains separated from the stratification can be divided into three main plant groups: cultivated plants, wild plants and trees and shrubs. This provides a basis for inferring economically used plants and local communities functioning in the vicinity of the investigated sites simultaneously with the Celtic settlements. The set of remains classified as cereal remains, from both sites in Samborowice, included almost 2.5 thousand elements (Table 3), 45.5% of which were classified only as undetermined cereals (*Cerealia* indet.), i.e. remains without taxonomic identification, usually because of their fragmentary character or state of preservation (Fig. 10).

The remaining 54.5% of the remains belonged to four wheat species: bread wheat (*Triticum aestivum*), emmer (*Triticum dicoccon*), einkorn (*Triticum monococcum*) and spelt (*Triticum spelta*), as well as barley (*Hordeum vulgare*), common millet (*Panicum miliaceum*), oat (*Avena* sp.) and probably rye (cf. *Secale cereale*). The most abundant group was the hulled wheat, which accounted for more than 70% of all identified cereals. In case of this group the identification was based mainly on vegetative residues, mainly fragments



FIG. 9. Remains of a fragment of an ear of undetermined cereal (*Cerealia* indet.) as a temper of pottery vessel found in fill of feature 85 on site 13 in Samborowice (photo by J. Soida)

TABLE 3. Summary of identified cultivated plants taxa. The total number of all separated remains for each taxon is given

Taxon	Samborowice		Total
	Site 13	Site 17	
Bread wheat <i>Triticum aestivum</i>	23	10	33
Emmer <i>Triticum dicoccon</i>	86	21	107
Einkorn <i>Triticum monococcum</i>	5	-	5
Spelt <i>Triticum spelta</i>	115	57	172
Emmer or spelt <i>Triticum dicoccon</i> vel <i>spelta</i>	145	110	245
Einkorn or emmer <i>Triticum monococcum</i> vel <i>Triticum dicoccon</i>	71	3	74
Hulled wheats <i>Triticum monococcum</i> / <i>dicoccon/spelta</i>	242	100	342
Wheat <i>Triticum</i> sp.	95	22	117
Barley <i>Hordeum vulgare</i>	46	4	50
Common millet <i>Panicum miliaceum</i>	129	24	153
Oat <i>Avena</i> sp.	25	10	35
Common Rye? cf. <i>Secale cereale</i>	1	1	2
Undetermined cereals <i>Cerealía</i> indet.	808	307	1115
Common flax <i>Linum usitatissimum</i>	1	-	1
Total	1792	669	2461

of spikelets. Barley, common millet and rye were identified from charred caryopsis, while the remains identified as belonging to oat were small fragments of twisted awns (Fig. 11). In case of oat, it is uncertain whether its remains belonged to a cultivated or wild form. This is mainly due to the fact that the determination of this species requires the presence of spikelet remains, since the feature to distinguish between these forms is the scar on the lower husk formed when the lower flower in the spikelet breaks off. Species identification of oat on the basis of naked caryopsis or their imprints and awn fragments is impossible because of the high probability of confusion with wild oat (*Avena fatua*) (Lityńska-Zajęc, Wasylikowa 2005, 232). As regards the number of remains of particular species, the material collected at the Samborowice site was dominated by remains of spelt (*Triticum spelta*). The second most numerous remains were those of common millet (*Panicum miliaceum*), followed by emmer (*Triticum dicoccon*) and barley (*Hordeum vulgare*). Very similar values were found for the remains of bread wheat (*Triticum aestivum*) and oat (*Avena* sp.). When comparing data obtained for both sites in Samborowice, some differences can be observed. In case of bread wheat, the percentages are similar. At site no. 13, a slightly lower share of emmer was

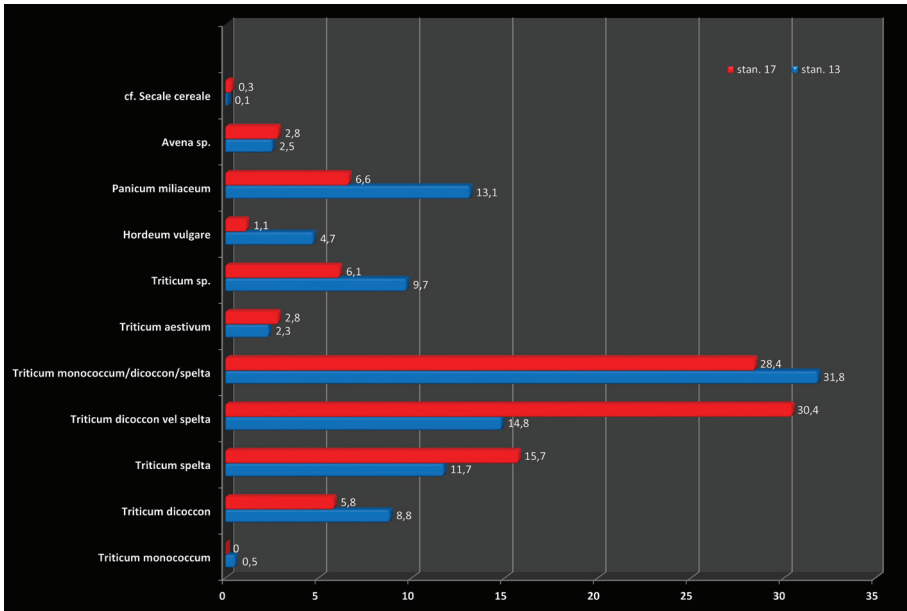


FIG. 10. Percentages of cereals in the assemblages of remains from sites 13 and 17 in Samborowice (prepared by A. Sady-Bugajska)



FIG. 11. Charred fragments of oat awns (*Avena* sp.). Samborowice site 17, feature 14 (photo by A. Sady-Bugajska) and a modern oat ear (source: Pixabay)

observed, while the share of barley was almost four times higher and the share of common millet was twice as high. In the materials from site no. 17, no remnants of einkorn were recorded, while the amounts of spelt and oat were comparable (Table 3).

Among the preserved remains, in the filling of feature no. 113 at site no. 13 in Samborowice, where the remains of a weaving workshop were found (Duleba, Słomska, Soida 2020, 287–302), common flax (*Linum usitatissimum*) seed was found (Fig. 12), which, in relation to its context and the presence of weaving weights, is a very important find as it constitutes the first and direct evidence of cultivation and use of flax in the discussed period in Poland. Plants, which based on the available knowledge could have been used by Celtic communities, found in Samborowice, include wart elder (*Sambucus ebulus*) and corn gromwell (*Lithospermum arvense*). Elder was identified on the basis of charred seeds, which may be all the more indicative of the collecting of the fruit of this shrub. *Lithospermum arvense* was identified on the basis of several tens of fruits (Fig. 13) found in three features (1, 13 and 15) at site 17. In case of features 1 and 15, there were single findings, while in feature 13, 36 little fruits were preserved. There is a lithospermin dye in the roots of the gromwells (Nowiński 1983, 128). It is a natural dye used to obtain a red colour that is extremely durable (<https://bankgenow.edu.pl>). This information, in the context of the remains of a weaving workshop found in Samborowice, may suggest that these plants were used for dyeing textiles.

The list of wild plants compiled on the basis of the archaeobotanical analyses conducted so far includes three taxonomic categories. To the level of species 38 plants were identified, to the level of genus 14. Some of the preserved remains, due to their fragmentary nature or poor state of preservation, were qualified only to a broader category, i.e. the family. Thus, 5 families were distinguished. In total, plant remains belonged to 16 families (Table 4). About three fourth (74%) of the identified species are taxa from the *Stellarietea mediae* class of anthropogenic nitrophilous communities of arable fields and annual ruderal plants (Matuszkiewicz 2001, 174). The weeds occurring here were typical of cereal crops (e.g. *Agrostemma githago*, *Centaurea cyannus*, *Bromus secalinus*) and root and garden crops (e.g. *Echinochloa crus-galli*). Other species represented meadow and pasture communities (of the *Molinio-Arrhenatheretea* class), communities of ruderal habitats of the *Artemisietea vulgaris* class, communities of over-water fertile sites (*Bidentetea tripartiti* class). There were also taxa which could grow in thermophilic forests and shrub communities (e.g. *Hypericum perforatum*), riparian forests (e.g. *Lapsana communis*)



FIG. 12. Charred flax seed (*Linum usitatissimum*), Samborowice site 13, feature 113 (photo by A. Sady-Bugajska) and a contemporary flax specimen (source: Pixabay)



FIG. 13. Corn gromwell fruit (*Lithospermum arvense*), Samborowice site 17, feature 13 (photo by A. Sady-Bugajska) and a contemporary corn gromwell specimen (source: Pixabay)

TABLE 4. Summary of identified wild plant taxa at sites no. 13 and 17 in Samborowice. The total number of remains for a given taxon is given. Plant names are given referring to Mirek *et al.* 2002

Taxon	Samborowice	
	Site 13	Site 17
Asteraceae		
Field chamomile <i>Anthemis arvensis</i>	2	-
Field chamomile? cf. <i>Anthemis arvensis</i>	1	-
Cornflower? cf. <i>Centaurea cyanus</i>	1	-
Cornflower <i>Centaurea</i> sp.	1	-
Nipplewort <i>Lapsana communis</i>	1	3
Aster family undetermined Asteraceae indet.	2	1
Boraginaceae		
Corn gromwell <i>Lithospermum arvense</i>	-	38
Gromwell <i>Lithospermum</i> sp.	-	2
Brassicaceae		
Field pennycress <i>Thlaspi arvense</i>	1	-
Caryophyllaceae		
Corncockle <i>Agrostemma githago</i>	15	-
Corncockle? cf. <i>Agrostemma githago</i>	1	-
Grass-leaf sandwort <i>Arenaria serpyllifolia</i>	1	-
Cuckooflower <i>Lychnis flos-cuculi</i>	-	1
Campion <i>Melandrium</i> sp.	2	-
Common chickweed <i>Stellaria media</i>	1	-
Pink family undetermined Caryophyllaceae indet.	16	7
Chenopodiaceae		
Fat-hen <i>Chenopodium album</i>	494	44
Sowbane <i>Chenopodium hybridum</i>	8	1

Oak-leaved goosefoot? <i>Chenopodium</i> cf. <i>glaucum</i>	2	-
Manyseed goosefoot? <i>Chenopodium</i> cf. <i>polyspermum</i>	3	-
Goosefoot <i>Chenopodium</i> sp.	1001	52
Goosefoot? cf. <i>Chenopodium</i> sp.	5	-
Cyperaceae		
Sedge <i>Carex</i> sp.	2	-
Sedge? cf. <i>Carex</i> sp.	2	-
Fabaceae		
Clover trefoil <i>Trifolium</i> sp.	1	1
Clover trefoil? cf. <i>Trifolium</i> sp.	-	1
Vetch <i>Vicia</i> sp.	3	-
Vetch? cf. <i>Vicia</i> sp.	1	-
Papilionaceous plants undetermined Fabaceae indet.	13	5
Hypericaceae		
Common St. John's-wort <i>Hypericum perforatum</i>	-	1
Lamiaceae		
Common hemp-nettle <i>Galeopsis tetrahit</i>	1	-
Common hemp-nettle? cf. <i>Galeopsis tetrahit</i>	1	-
Field blam mint <i>Mentha arvensis</i>	1	-
Field blam mint? cf. <i>Mentha arvensis</i>	1	-
Nepeta cf. <i>Nepeta</i> sp.	-	1
Self-heal <i>Prunella vulgaris</i>	1	2
Self-heal? cf. <i>Prunella vulgaris</i>	1	-
Mint family undetermined Lamiaceae indet.	7	-
Papaveraceae		
Greater celandine <i>Chelidonium majus</i>	2	-

cont. Table 4

Plantaginaceae		
Buckhorn plantain <i>Plantago lanceolata</i>	1	-
Buckhorn plantain? <i>Plantago cf. lanceolata</i>	3	-
Plantain <i>Plantago sp.</i>	3	1
Plantain? <i>cf. Plantago sp.</i>	1	1
Poaceae		
Wind bent grass <i>Apera spica-venti</i>	1	1
Chess brome <i>Bromus secalinus</i>	40	1
Chess brome? <i>Bromus cf. secalinus</i>	20	4
Brome <i>Bromus sp.</i>	557	125
Brome? <i>cf. Bromus sp.</i>	43	11
Crabgrass <i>Digitaria sanguinalis</i>	1	-
Crabgrass? <i>cf. Digitaria sanguinalis</i>	1	-
Chicken parus-grass <i>Echinochloa crus-galli</i>	6	1
Chicken parus-grass? <i>cf. Echinochloa crus-galli</i>	4	1
Timothy grass <i>Phleum pratense</i>	40	3
Timothy grass? <i>cf. Phleum pratense</i>	103	8
Timothy <i>Phleum sp.</i>	1	-
Timothy? <i>cf. Phleum sp.</i>	-	3
Annual meadow-grass <i>Poa annua</i>	1	-
Green bristle grass/bur bristle grass <i>Setaria viridis vel Setaria verticillata</i>	19	3
Millet <i>Setaria sp.</i>	2	2
Millet? <i>cf. Setaria sp.</i>	2	1
Panicoideae undetermined Panicoideae indet.	7	1
Grass family undetermined Poaceae indet.	225	93

cont. Table 4.

Polygonaceae		
Black bindweed <i>Fallopia convolvulus</i>	13	3
Black bindweed? <i>cf. Fallopia convolvulus</i>	1	1
Prostate knotweed <i>Polygonum aviculare</i>	3	1
Cultop lady's-thumb <i>Polygonum lapathifolium</i>	7	-
Spotted lady's-thumb <i>Polygonum persicaria</i>	5	1
Spotted lady's-thumb? <i>Polygonum cf. persicaria</i>	3	1
Knotweed <i>Polygonum sp.</i>	9	2
Knotweed? <i>cf. Polygonum sp.</i>	5	-
Sheep's sorrel <i>Rumex acetosella</i>	19	7
Sheep's sorrel? <i>Rumex cf. acetosella</i>	1	-
Curly dock <i>Rumex crispus</i>	3	-
Curly dock? <i>Rumex cf. crispus</i>	2	-
Curly dock/bitter dock <i>Rumex crispus/obtusifolius</i>	3	3
Rubiaceae		
False cleavers <i>Galium spurium</i>	10	8
False cleavers? <i>Galium cf. spurium</i>	6	3
Catchweed? <i>Galium cf. aparine</i>	1	-
Bedstraw <i>Galium sp.</i>	17	-
Bedstraw? <i>cf. Galium sp.</i>	1	2
Scrophulariaceae		
Ivy-leaved spedwell <i>Veronica hederifolia</i>	7	18
Spedwell? <i>cf. Veronica sp.</i>	1	1
Solanaceae		
Black henbane <i>Hyoscyamus niger</i>	-	1
Varia		
Undetermined Indet.	2960	1177
Total	5750	1649

and xerothermic grasslands (e.g. *Arenaria serpyllifolia*). Representatives of meadow and pasture communities were cuckooflower (*Lychnis flos-cuculi*), timothy grass (*Phleum pratense*), buckhorn plantain (*Plantago lanceolata*) and self-heal (*Prunella vulgaris*). Annual meadow-grass (*Poa annua*) and prostate knotweed (*Polygonum aviculare*) may have grown in trampled areas.

The anthracological analysis of charred wood residues preserved on both sites, separated both during the soil sampling and the fragments collected during the exploration of the sites, allowed to establish a list of taxa which most probably constituted elements of the stand growing in the vicinity of the investigated sites during the functioning of the La Tène culture settlements and undoubtedly were used by the inhabitants. On both sites the largest number of wood fragments of deciduous species were preserved. Three species of trees and one species of shrub were identified, as well as five genera of trees and one genus of shrub. A significant proportion of the preserved charcoals were classified only in the tree group (deciduous/coniferous). In terms of frequency, oak (*Quercus* sp.) remains were the most numerous. Then, in order of the number of separated fragments: common beech (*Fagus sylvatica*), common hornbeam (*Carpinus betulus*), birch (*Betula* sp.), alder (*Alnus* sp.), elder (*Sambucus* sp.), elm (*Ulmus* sp.), maple (*Acer* sp.) - (Table 5). The proportion of coniferous trees was small. Based on the preserved charcoal fragments, two tree species from this group were

TABLE 5. Summary of identified trees and shrubs at sites no. 13 and 17 in Samborowice

Taxon	Type of remains	Samborowice	
		Site 13	Site 17
Maple <i>Acer</i> sp.	ch	3	2
Alder <i>Alnus</i> sp.	ch	13	1
Birch <i>Betula</i> sp.	ch	42	34
European hornbeam <i>Carpinus betulus</i>	ch	57	32
European beech <i>Fagus sylvatica</i>	ch	111	39
European ash <i>Fraxinus excelsior</i>	ch	-	14
Oak <i>Quercus</i> sp.	ch	395	100
Elm <i>Ulmus</i> sp.	ch	6	1
Dwarf elder <i>Sambucus ebulus</i>	s	7	2
Elder <i>Sambucus</i> sp.	s	10	-
Silver fir? cf. <i>Abies alba</i>	ch	2	3
Scots pine? <i>Pinus sylvestris</i>	ch	3	-
Deciduous diffuse- -porous Dicotyledones	ch	291	82
Deciduous Dicotyledones	ch	295	174
Coniferous Coniferae	ch	23	11
Total		1258	495

identified (probably Scots pine cf. *Pinus sylvestis*, and common fir? cf. *Abies alba*), some of the charcoals were classified as coniferous only. After comparing the percentages of deciduous and coniferous tree remains in the studied charcoal sets for both sites, it turned out that they were almost identical (deciduous/coniferous species – site 13: 97.8%/2.2%; site 17: 97.2%/2.8%).

VI. ZOOLOGICAL DATA ANALYSIS

The data from the analyses concerning the breeding economy of the Celts in the early and middle La Tène period in Poland were compared with other areas of their settlement. For this purpose, information from selected sites of similar chronology from Moravia and the middle Danube basin (Lower Austria) was used. These are the areas from which it seems that the Celts migrated to our lands. The main criterion was the compilation of shares of four basic economic species – cattle, pig, sheep and goat. On the basis of the obtained results, it can be assumed that the breeding structure of the Celtic community inhabiting the areas of Lower and Upper Silesia and western Lesser Poland in the Iron Age did not differ much from their relatives from the Central European area. In general, cattle were the most important animal for providing meat and fat. In this context, it is interesting to note the secondary role played by animals in the provision of meat feed, namely pigs and small ruminants. Material from Upper Silesia indicates that in this area the economy was based on the rearing of cattle, sheep and goats, with pigs being slightly less important. Similar data were provided by sources from Lower Austria, where small ruminants occupied the first place in terms of frequency (Roseldorf, Hollabrunn district – Bruckner-Höbling 2009; Michelndorf, Tulln district – Galik 2008), or the second place (Göttlesbrunn, Bruck an der Leitha district – Pucher 2006; Inzersdorf-Walpersdorf, Sankt Pölten district – Pucher 1998). Only in the settlement in Mitterretzbach, Hollabrunn district both in the early and middle La Tène period, sheep and goat bones were at the third place (Schmitzberger 2012) – (Table 6). A similar species structure of livestock was recorded in a large and extensively studied settlement dating to LT B2-C1 phases at Sajópetri – Hosszú-dűlő, Borsod-Abaúj-Zemplén district in eastern Hungary (Bartosiewicz 2007, 286, fig. 68–69). In Lower Silesia, on the other hand, there was slightly more interest in keeping pigs than in keeping small ruminants. The data from this area refer to sites in Moravia where, apart from the settlement in Slatinky, Prostějov district, the pig in terms of frequency

was in second place, after cattle (Čižmář 2015, tabela 1) – (Table 7). The above considerations do not include materials from western Lesser Poland, as heterogeneity in the breeding structure was found at the three sites described earlier. Therefore, with a large dose of caution, it can be suggested that the mechanisms of social and cultural, and economic transformations in Upper Silesia were inspired by communities inhabiting the region of Lower Austria, and in Lower Silesia by communities from Moravia. At present, these deductions are only an indication for further research into the history of the settlement of Polish lands by the Celts and their local economy. At the same time it seems that deepening archaeozoological comparisons taking into account detailed data from specialist analyses for individual Celtic settlements (many data are missing even in published materials) can bring concrete arguments and evidence pointing to the origin of the population groups that arrived in our lands.

The dominance of finds of cattle remains is a very characteristic feature of typical Iron Age rural settlements. The cattle breeding requires more space and also provides some important life values such as milk or manure fertiliser which was also important at that time. In large proto-urban settlements, such as those in Nowa Cerekwia and Roseldorf in Austria, cattle rearing was significantly hampered by the lack of adequate space in the immediate vicinity of households. In addition, the majority of the population in these agglomerations were probably involved in crafts and trade, which further necessitated the rearing of smaller animals such as pigs, goats and sheep. A similar relationship can be observed at late La Tène oppida, where, as shown by the results of bone material analyses from the best studied oppidum of this type so far, Manching, Ingolstadt district in Bavaria (Boessneck 1971), the pig is by far the most widely reared and consumed animal (Sievers 2004, 59). A certain deviation from the presented rule are the results of the analysis of animal bones from the settlement at Kurzątkowice in Lower Silesia, where the predominance of pig bones may suggest that the population living there concentrated on occupations other than cattle breeding and agriculture. This hypothesis is supported, at least in part, by the fact that a pottery kiln was recorded there (Dułęba, Kosicki 2017). The very low percentage of wild animal bones recorded in the fills of objects from La Tène culture settlements indicates that the regions of southern Poland inhabited by the Celtic settlers were already largely farmed and deprived of large forested areas. This is most evident in the settlements of Lower Silesia, where only in the pit-house from the Górzec settlement were bones of wild animals recorded (Table 2). This also

TABLE 6. Share of the basic four breeding species in the sediments from Upper Silesia and Lower Austria (according to Trebsche 2014, Table 2:35) during the La Tène period

Site	Region	Chronology	Cattle %	Sheep/goat %	Pig %	Number of bones
Nowa Cerekwia 4	Upper Silesia	LT B2-C2	36.8	31.7	31.5	8148
Samborowice 13	Upper Silesia	LT B2-C2	74.8	13.9	11.3	266
Samborowice 17	Upper Silesia	LT C1-C2	40.3	32.3	27.4	663
Inzersdorf-Walpersdorf	Lower Austria	Ha D3-LT B2-C1	55.5	24.0	20.4	1774
Michelndorf	Lower Austria	LT B2-C2	33.4	35.9	30.7	1715
Mitterretzbach	Lower Austria	LT B	37.5	29.7	32.7	596
Mitterretzbach	Lower Austria	LT C	35.9	25.1	32.3	621
Göttlesbrunn	Lower Austria	LT C	41.8	32.8	25.4	1317
Roseldorf settlement	Lower Austria	LT C	16.6	42.5	41.0	6569

TABLE 7. The proportion of the basic four breeding species on sediments from Lower Silesia and Moravia (according to Čížmář 2015, Table 1: 447) during the La Tène period

Site	Region	Chronology	Cattle %	Pig %	Sheep/goat %	Number of bones
Kurzątkowice 1	Lower Silesia	LT B1-B2	38.9	43.5	17.6	108
Ślęża 11-12	Lower Silesia	LT B2-C1	69.6	24.3	6.1	66
Wrocław-Partynice 6	Lower Silesia	LT B2-C1	89.5	10.5	-	19
Górzec 13	Lower Silesia	LT C	60.8	18.9	20.3	74
Brno-Slatina	Moravia	LT C1-C2	44.8	30.4	24.8	852
Dolní Sukolom	Moravia	LT C1	52.4	38.1	9.5	21
Hulín	Moravia	LT C1-C2	52.4	28.9	18.7	166
Mistřín	Moravia	LT B2-C2	22.1	26.6	51.3	3293
Slatinky	Moravia	LT C	58.1	14.0	27.9	43
Šlapanice	Moravia	LT A-C2	57.3	27.1	15.6	96
Tvarožná	Moravia	LT C	69.5	18.6	11.9	59
Vyškov	Moravia	LT A-C2	68.1	23.4	8.5	47

shows that domesticated animal husbandry was well developed and largely secured the demand for meat consumption. This trend is clearly visible with the development of Celtic settlements, when from the middle La Tène period

onwards the proportion of wild animals among remains laid after consumption decreases significantly (e.g. settlements from the Lower Austrian area - Trebsche 2014, fig. 13). In the La Tène period, this trend intensifies and wild animals appear very rarely among remains left after consumption. For example, at the Moravian oppidum Staré Hradisko, Prostějov district bones of wild animals accounted for 0.5% of the entire osteological set (Čižmář 2005, 31–32), and in the above-mentioned Bavarian Manching oppidum only 0.2% (Boesneck 1971, 5).

VII. BOTANICAL DATA ANALYSIS

Based on the available information on the plant economy of local communities of the La Tène culture, it can be concluded that cereal cultivation was one of the most important occupations of these communities. Plant products, at least in areas with fertile soils, were more important than animal products. This is supported by the nature of the settlements, which as a rule were concentrated on fertile land (Fig. 2), and by the very rich assortment of iron agricultural tools known from the sites of this culture (Venclová *et al.* 2008, 53–54, fig. 28; Pieta 2008, 214–228, fig. 103–110; Danielisová 2018, 188–190). The research carried out in Samborowice provided evidence of agricultural activity of the Celtic community, complementing the hitherto scarce archaeobotanical data base for this cultural unit. Bearing in mind the paucity of information on plant economy in the La Tène period, the importance of botanical analyses conducted simultaneously with the archaeological excavations at sites no. 13 and 17 in Samborowice should be emphasised. The excavated and identified remains of cultivated plants are undoubtedly evidence of their cultivation, but the evaluation of the role of particular taxa in cultivation structures, both in relation to the sites in Samborowice and in a broader regional or national context, is already problematic.

Previous research has indicated that the main cereal for communities living in Polish areas in the La Tène (Pre-Roman) period was rye (Lityńska-Zajac 1997a, 66, tables 6–7). This conclusion is based on the compilation of results from four sites from Lesser Poland, three of which are settlements of the Tynec Group, dated to the late La Tène period, while only one of them (the settlement in Pełczyska, Pińczów district) was dated to the middle La Tène period (Woźniak 1970, 221). Since rye was recorded at all four sites, this was probably the basis for this finding. Rye played an important role in later

periods, but was never the dominant cereal (Wasylikowa *et al.* 2002, 43). The results of botanical analyses obtained for the discussed time interval from the sites investigated in the last years (Zagórze, Samborowice, sites 13 and 17) provided data which suggest that the importance of particular cereal species might have been different than assumed. Rye (*Secale cereale*) appeared on those three sites in the form of single finds. This state of affairs does not allow confirming the previously drawn conclusions about the significant role of rye at that time. On the contrary, it proves the insignificant role of this species in cultivation structures. Most probably in the early and middle La Tène period this cereal did not yet change its status of a weed appearing in wheat sowings.

Based on the results obtained for both sites in Samborowice, it can be assumed that the dominant cereals were hulled wheat, mainly emmer and spelt. The share of einkorn was probably marginal at that time. Common millet and undoubtedly barley played an important role. The above conclusion is in contradiction with the statement that it is the Celts who are credited with popularising the cultivation of rye and oats in areas lying in the Odra and Vistula basins, while the cultivation of common millet played a marginal role at that time, particularly in the eastern Lesser Poland (Podkarpacie) region (Rodzińska-Nowak 2012, 100; please find further references there). The cereal assortment of the Celtic communities in the south-western region (Silesia) may have differed in terms of species composition or proportions between particular cereal types from those defined for the sites of contemporaneous cultures from the area of Lesser Poland. Interestingly, the knowledge that it was the Celts who spread oat is quite common (Woźniak 1970, 221–222; Lityńska-Zajac 1997a, 168; Pieta 2008, 213; Danielisová 2018, 191). The absence of traces of cultivated oat at Samborowice is not necessarily evidence that they were not grown. This may be due to the way this cereal was used. Wanda Giźbert (1971, 20) quotes the ancient writer Columella (*De re rustica*, II 10) that oat were originally used mainly for green fodder for cattle because, as the author writes “...*did not immediately (...) become familiar with the nutritional value of the plant's grain*”. This observation may be very useful in trying to assess the status of oat in the Celtic economy. The use of the cereal for green fodder meant that plants were cut down before fruiting, and certainly before the mature ears had dried (as is the case when cereals are grown for grain). Oat is harvested for green fodder or for drying before heading, i.e. when the grain has the highest protein and carotene content and a low fibre content (Herse 1982, 142). Assessing the role of rye in Celtic cultivation is difficult. Available information from aggregate studies on the proportion of cereals

in particular cultural units and chronological sections (e.g. Wasylkowa *et al.* 2002) demonstrate a clear share of this cereal. This may be due to the aggregate treatment of the data for the Pre-Roman and Roman period sites.

A comparison between the results from Samborowice and other sites is only possible with regard to site 2 in Zagórze, Wieliczka district in western Lesser Poland (Lityńska-Zajac *et al.* 2015), where remains of sites associated with the La Tène culture and the Tyniec group were found. The results of archaeobotanical analysis of materials from these sites were relatively modest. Remains of cultivated plants were preserved in the sites associated with the aforementioned cultural units. Among the identified taxa the most numerous was common millet (*Panicum miliaceum*), which allows us to assume that this cereal was dominant. Barley (*Hordeum vulgare*), bread wheat (*Triticum aestivum*), emmer (*Triticum dicoccon*) and spelt (*Triticum spelta*) were represented by single specimens (Lityńska-Zajac *et al.* 2015, 172–173, tables 6–7). The listed set of cereals is identical to that obtained for the materials from Samborowice, the difference may be revealed in the proportion of particular taxa. However, it is difficult to assess this in case of single finds in the materials from Zagórze. It should be remembered, however, that in case of archaeobotanical materials the composition of the remains found is the result of many factors, which means that the analysed subfossil assemblages are often only a fragment of larger complexes, and the shares of individual taxa do not necessarily reflect their original share in cultivated structures. Apart from the statement of general similarity at the level of the list of identified species on the sites in Samborowice and Zagórze, inference about other aspects of cultivation is problematic. Despite the awareness of the incompleteness of data on the economy of La Tène communities inhabiting the south-western areas of present-day Poland, it is worthwhile at this point to trace how the findings on this topic have evolved in other regions of Europe.

On the basis of data gathered in sites in the Czech Republic, it is known that the Celts in the La Tène period cultivated all the crops known at that time, i.e. einkorn and emmer, bread wheat, common millet, rye, oat and especially barley, which is considered to be the dominant species (Filip 1962, pp. 110–111; Beranová 1980, 78; Venclová *et al.* 2008, 54–55). This cereal occurred on 34.4% of the La Tène sites in the Czech Republic. The second place was occupied by naked wheat (mainly bread wheat) and emmer. They occurred on 28.1% and 21.9% of the examined sites, respectively. They were followed by spelt (15.6% of the sites) and common millet (9.4% of the sites). The presence of oat and rye was recorded only on 3.1% of the sites. Low percentage of finds of the last three species may be explained by the fact that oat and rye were just entering

cultivation, and the importance of common millet was decreasing in the discussed period (Kočár, Dreslerová 2010, 222). A slightly different crop species structure has been recorded on the basis of large data series from Central European oppida (Staré Hradisko, Stradonice, Závist, Manching) from the La Tène period, where different varieties of wheat are clearly dominant, typically accounting for more than 50% of the total cereal assortment (Čižmář 2005, 29). Interestingly, these data agree with those obtained from the contemporary oppidum, a typical rural settlement discovered in Moravia in Bořitov, Blansko district, where large-scale excavations have been carried out (Čižmář 2003, 91–92). A set of cereals consisting of barley, common millet, emmer, spelt and naked wheats is found in archaeobotanical studies from sites in Austria (e.g. Dürrenberg: Swidrak 1999; Roseldorf-Sandberg: Holzer 2008; Heiss, Kohler-Schneider 2014, Kohler-Schneider *et al.* 2015; Oberleiserberg, Michelstetten and Mitterretzbach: Heiss, Kohler-Schneider 2014), in Germany (e.g. Neckar valley: Sitka 1999; Eberdingen-Hochdorf: Sitka 1996, Enayat 2014) and Slovakia (Hajnalová 1975). In central Europe, therefore, there is a predominance of barley and rather emmer, while in areas of northern Europe spelt, which was characterised by its ability to grow in different types of soil, its resistance to frost and its resistance to pests and diseases, was of major importance in the economy of the barbarian communities, taking over from the emmer wheat, which was preferred in the Bronze Age (Pitts 2015, 327).

Relating the above results to those obtained for Samborowice, one may conclude that the basic set of cereal plants and their significance in cultivation structures could be very similar. The lack of more remains of “new” cereals for those times - oat and rye, could be caused by the fact that the moment of settlement was captured, when these cereals were not yet introduced to cultivation. The dissemination of rye cultivation and the beginning of oat cultivation on the territory of contemporary Polish lands took place as late as in the Roman period (Lityńska-Zajac 1997b, 465). The remains of non-cereal cultivated plants from Polish sites are scarce. At the site in Pelczyska the seeds of pea (*Pisum sativum*) were preserved (Woźniak 1970, 221), at the site Kraków-Tyniec the imprints of fruits of buckwheat (*Fagopyrum* sp.), seeds of pea (*Pisum* sp.) and pea or vetch (*Pisum* sp. *vel* *Vicia* sp.) were found. In the material from the Kraków-Wyciąże, site 5 seeds and fragments of fieldbean seeds were preserved (*Vicia faba* var. *minor*) (Lityńska-Zajac 1997a, 214). The research in Samborowice (site 13) confirmed, however, the cultivation and use of common flax (*Linum usitatissimum*). This is probably the first and so far only find of this plant from that period in Poland. It is possible that some of the remains from the Samborowice set, identified as

papilionaceous plants (Fabaceae indet.), could have belonged to cultivated species.

A more complete list of plants used during the La Tène period can be found in European studies. The set of cultivated plants (non-cereal) from the leguminous group includes pea (*Pisum sativum*), lentil (*Lens culinaris*), bean (*Vicia faba*), grass peavine (*Lathyrus sativus*), and vetch (*Vicia sativa*). From the technical plants, flax (*Linum usitatissimum*), hemp (*Cannabis sativa*), poppy (*Papaver somniferum*), gold of pleasure (*Camelina sativa*), (Dálnoki, Jacomet 2002; Kočar, Dreslerova 2010; Kohler-Schneider *et al.* 2015; Swidrak 1999; Venclová *et al.* 2008) appeared on the La Tène sites. M. Beranová (1980, 78) writes that fat-hen (*Chenopodium album*) and white and yellow turnips, onions, garlic and other vegetables and plants used for dyeing were probably also grown.

Wild plant gathering undoubtedly played a significant role in supplementing the menu of the Celts (Venclová *et al.* 2008, 57; Pieta 2008, 213; Danielisová 2018, 193–194). However, on the share of plants collected from the wild in their diet it is difficult to conclude based on the available data from Polish sites. The only information on this topic can be found in a study on the cemetery in Kietrz, Głubczyce district. In the tomb no. 1305 fourteen hazelnuts (*Corylus avellana*) were found, well preserved due to their proximity to bronze objects (Gedl 1978, 30–31). Data from Hungary, Germany and Austria attest to the presence of species such as hazelnut (*Coryllus avellana*), cornelian cherry (*Cornus mas*), perry (*Pyrus cf. pyraster*), blackthorn (*Prunus spinosa*), dwarf cherry (*Prunus fruticosa* = *Cerasus fruticosa*), whitethorn (*Crataegus monogyna*), rowan (*Sobrus aucuparia*), common elder (*Sambucus nigra*), raspberry (*Rubus idaeus*), blackberry (*Rubus fruticosus*), European strawberry (*Fragaria vesca*), wine grape (*Vitis vinifera* ssp. *vinifera/sylvestris*) (Dálnoki 2009; Dálnoki, Jacomet 2002; Enayat 2014, Kreuz, Schäfer 2008; Swidrak 1999). Archaeological findings from the Czech Republic prove the collection of hazelnuts, blackthorn, cornelian cherry, gean, hornbeam nuts (Závist, Mšecké Žehrovice I) and mushrooms, duckweed (Lovosice), acorns and beechnuts. From the La Tène period or the turn of the La Tène period there are finds from sites in Central Europe confirming the use of wild varieties of plums, apples and pears (Venclová *et al.* 2008, 57; find additional literature there).

Wood remains in the form of charcoal are among the most common plant remains found on archaeological sites. The identification of these materials makes it possible to deduce about the trees used by given communities for various purposes. It is also an important source for studying forest communities located in the vicinity of human settlements (Lityńska-Zajac, Wasylkowa 2005, 274). The composition of the found subfossil wood sets depends

on many factors. One of the most important is the selection made by humans. This in turn depended on the set of woody vegetation available in the immediate vicinity of the surveyed settlements during the period of their functioning. The selection of specific taxa undoubtedly took place during the extraction of wood as a fuel material for technological processes and for the manufacture of utilitarian objects (Lityńska-Zajac, Wasylkowa 2005, 275), where the type and properties of wood had a great impact on the effects of the above activities. The trees identified on the basis of charcoal from the Samborowice sites are mainly elements of local vegetation. Due to the fact that the examined set of these remains consisted of small fragments of charcoal collected from various sites (dispersed set), assessment of human use of specific species is unfortunately difficult. The crumbled and scattered material within the sites, without finds occurring in clusters or distinct groups, revealing themselves during the exploration of the sites, and without a clear archaeological context, cannot be the basis for making inferences about the specific procedure or activity in which the wood was used. The purposefulness of using specific species, in the case of the discussed materials from the sites in Samborowice can only be discussed in relation to the remains of oak wood, which occurred in the greatest number. Oak is the taxon most frequently encountered on archaeological sites, practically in all time sections/periods.

The situation is different when the context condition is met, as was the case with the aforementioned grave no. 1305 at the Kietrz site, where fragments of a wooden vessel/box were preserved due to the conditions of the deposit (presence of metals). The analysis showed that the object deposited in the grave was made of beech wood (*Fagus sylvatica*) (Gedl 1978, 30–31, table II:13). This is the only confirmed finding of the use of a specific type of wood for the production of utilitarian objects, dated to the La Tène and originating from Silesia.

The list of taxa compiled for Samborowice allows an attempt to reconstruct the composition of the forest stand in this area, as it confirms the information that can be obtained from the analysis of the maps of potential natural vegetation for this region (Matuszkiewicz *et al.* 1995). Namely, at the time of the functioning of the La Tène settlements, the dominant formations in the vicinity of the settlements could have been sub-continental lime-oak-hornbeam forests and lowland alder and ash-alder forests in the Psina river valley. Information on tree remains from other sites chronologically and culturally analogous to the Samborowice sites is very scarce. They concern determinations obtained on site 2 in Zagórze (Lityńska-Zajac *et al.* 2015) and site 1 in

Podłęże (Woźniak 1990). The charcoal results for the Tyniec Group sites from Zagórze showed the dominance of oak (*Quercus* sp.) remains, with a significant proportion of Scots pine (*Pinus sylvestris*). Oak wood was present in all types of sites identified on the site, especially in various types of pit. Wood remains were preserved in the relics of kilns, which clearly indicates the use of wood of these taxa as fuel material, and the significant share of oak is a confirmation of the choice of this genus due to its properties (Lityńska-Zajac *et al.* 2015, 164). The similarity to the results from Samborowice is, apart from the dominance of oak, the strong predominance of deciduous trees. At the second of the aforementioned Lesser Poland sites, traces of trees, specifically willow (*Salix* sp.), were identified on the basis of a single imprint of a leaf fragment (Lityńska-Zajac 1997a, 214).

The results of the study of charred wood remains and data from the analysis of the map of potential natural vegetation provided a general appearance of the surrounding woody vegetation. The picture of the local flora of the Samborowice area in the La Tène was complemented by information obtained from the phytosociological analysis carried out for the identified wild plants. The majority of species grew in synanthropic communities, on habitats altered by man, mainly as a result of arable farming. Thus, the presence of weeds proves the presence of arable fields in the landscape, while species of meadow communities confirm the existence of hay meadows or/and pastures. In the closest vicinity of the houses the so-called carpet phytocenoses probably developed, formed by moderately nitrophilous species growing in dense, low and adjacent to the ground grasslands, very resistant to mechanical damage (e.g. trampling) (Matuszkiewicz 2001, 259). The presence at a relatively short distance from the river sediments, justifies the presence of plants occurring in waterside, scrub or riparian surroundings.

VIII. SUMMARY

Until now, the general lack of source materials kept the farming economy of the Iron Age societies in Poland outside of the main research focus. Only excavations carried out in the last twenty years have provided data that we can use much more effectively. These are data from well-preserved and documented archaeological contexts. Their undoubted advantage is that they are compiled to current standards and can be subjected to further, additional analysis. The review of data presented above concerning the basis of the agrarian and

livestock economy of the La Tène culture communities inhabiting the area of southern Poland shows great similarities with the economy of their relatives inhabiting the area south of the Carpathians and the Sudetes. Was the settlement of the La Tène culture in Silesia and Lesser Poland a kind of “Celtic borderlands”? Did the material culture of the local settlers differ from the core area of the civilisation of the Celtic tribes? In terms of quality, certainly not. This is evident in almost all aspects of material culture and in the economic field. The area of Silesia, and later also the area of Lesser Poland, was colonised by the Celts in order to control communication routes that enabled cultural interaction with vast areas of the Central European Lowlands and the southern coasts of the Baltic. The analysis of the settlement network and its simplest – quantitative – comparison with the cultures existing before and after the settlement of the Celts shows that it was a relatively well-organised but very sparse community. It should also be emphasised that it made optimum use of the area it controlled, where it was possible to freely develop all areas of the contemporary economy.

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