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## THE ŁĘCZYCA EVIDENCE OF PLANTING AN INDUSTRIAL FOREST ABOUT THE YEAR 1590

Since the appearance of the species, humans have lived in symbiosis with the forest. At the beginning, this was a relationship of subjugation and dependence, where, however, the privilege of using the forest's resources gradually prevailed. In the forest, people found edible plants and animals, building materials for their huts and subsequently houses as well as other materials used for making numerous indispensable everyday objects, particularly parts of tools and weapons. The forest provided firewood, huge amounts of which were used by workshops, especially furnaces.

The situation remained unchanged at the beginning of the Middle Ages, when people cultivated the land, lived in the fields and ate farm produce and the meat of farm animals on the one hand, but they still lived in timber houses and used mainly wooden objects in their everyday life on the other. Contemporary man still exploited the forest for wood, hunting, mushrooms and fruit as well as used it to graze his animals. At the beginning of the Middle Ages, in Central and Eastern Europe, woodland was such an important source of food and materials that many of them, like skins of some wild animals, were used as money. Currency of this type, particularly the skins of martens and grey-squirrel skins, was most widespread in Rus. It should also be noted that the kuna (the marten) still remains the basic monetary unit in Croatia.

Although forests were heavily exploited, no attempts were made to manage or regenerate them. For contemporary Central European society, woodland constituted, and was to remain, a rich source of all sorts of material goods<sup>1</sup>.

In Poland, the situation lasted throughout the Middle Ages to the end of the fifteenth century and did not change much in the sixteenth and the seventeenth centuries<sup>2</sup>. Meanwhile, Western Europe had already suffered the consequences of excessive forest exploitation. The fact that forest resources were not unlimited was made clear as early as 1068, when the great survey of England was made by order of William the Conqueror and recorded in *Domesday Book*. Rackham<sup>3</sup> calculated according to this account that only 15 percent of the area of eleventh-century England was covered in forest. The general landscape consisted of farmland with islands of forest.

It is known that the first instruction regarding cutting down forests, which included regulations governing the preservation of some forest areas, was introduced as early as 1226. From the fourteenth to the seventeenth century, instructions of this type regarding public property as well as public and private areas adjacent to rivers were issued regularly and usually followed a change of the ruler or even the royal government official responsible for this branch of the economy<sup>4</sup>. In Teutonic Prussia, the threat of excessive cutting down of forest areas was noticed as early as the fourteenth century and as a result, during the following century the Grand Masters issued regulations governing the economical use of forests<sup>5</sup>.

<sup>2</sup> The records of royal estate surveys of 1564-1565 and 1628-1632 conducted in Great Poland and Kujawy best reflect this situation.

<sup>3</sup> O. Rackham, *Trees & Woodland In the British Landscape. The Complete History of Britain's Trees, Woods and Hedgerows*, London 1990, p. 50-54.

<sup>4</sup> A. Zabko-Potopowicz, *Zarys rozwoju wiedzy leśnej do pierwszej wojny światowej (A Brief History of Forestry Development to World War I)*, Wrocław-Warszawa-Kraków 1968, pp. 35-44.

<sup>5</sup> M. Arszyński, *Drewno jako budulec w Prusach Krzyżackich-przyczynek do badań nad rolą drewna w budownictwie*

<sup>1</sup> S. Trawkowski, *Człowiek wobec lasów w Polsce średniowiecznej (Man and Forests in Medieval Poland)*, [in:] *Pamiętnik XII Powszechnego Zjazdu Historyków Polskich 17-20 września 1979*, Parts 1-4, ed. S. K. Kuczyński, Katowice 1979, pp. 271-277.

This was also the case with the Austrian and Hungarian Habsburg domains, where the methods of cutting down and replanting forests were delineated as early as the sixteenth century. Penetration and clearing as well as regeneration by means of planting seed-trees and seedlings grown in forest nurseries in clearings were recorded. Forest nurseries and young groves had to be surrounded by fences so that the little trees were not destroyed by wild animals<sup>6</sup>. It might therefore be assumed that the basics of modern forestry formed in great European domains during the fifteenth and the sixteenth centuries. However, the rules and regulations regarding the forest economy were often limited to the protection of royal game. As far as the British Isles are concerned, in his standard work, *Trees and Woodland in the British Landscape*<sup>7</sup>, Oliver Rackham writes: "other countries have forestry policies and laws, to which students of forest history devote inordinate attention, but in England these are few and unimportant."

Unfortunately, we have at our disposal no similar information about great Polish domains belonging to the king, lords or church authorities. Forests are often mentioned as a source of materials for building houses and boats as well as firewood. A document of 1381 can serve as an example here. It was issued by Władysław, Duke of Opole, and it is one of the oldest documents being evidence of forest exploitation. The document burdens the peasants from the village of Opatów on the bank of the Prosna River with the duty to participate in the building of the castle in nearby Bolesławiec-on-Prosna and to construct bridges leading to the fortress<sup>8</sup>. The modern village of Opatów is still adjacent to a large area of woodland owned by the state, which, in the nineteenth century, was the property of the successor to the throne of the Kingdom of Prussia. At the time when the document was issued, the inhabitants of Opatów belonged to St. Vincent's Benedictine Abbey in Wrocław, but the castle in Bolesławiec was the duke's investment and the duke had the

right to burden the peasants with a duty to participate in the castle's construction.

Our knowledge about forests and forest exploitation in the fourteenth and the fifteenth centuries is scanty. Publications dealing with the customs and tariffs levied at the Gdansk harbour are very significant in this respect. According to them, during the fifteenth century, the export of timber for building boats was gradually becoming the second largest export of Poland<sup>9</sup>. In some years of the seventeenth century, over 80 percent of the wood shipped across the Baltic Sea and through the Danish straits to the North Sea came from Gdańsk. More detailed information can be found in, among others, Danish customs books, where all the ships sailing through the Strait of Sund as well as the cargo they carried were recorded<sup>10</sup>.

Polish historians have at their disposal a very special record containing information about, among other things, the character and economic value of royal property at the beginning of the second half of the sixteenth century. This is the summary of a survey of royal property made by order of the Sejm (legislature) in coordination with the monarch and the Senate. In Great Poland, including the District of Łęczyca and the District of Sieradz, as well as in Kujawy the inventories were completed in the years 1564-1565. Inventories of nineteen districts governed by *starostas* (provincial royal officials) were made. The records included castles, manors and villages owned by the king. They also mentioned the incomes of the districts governed by *starostas*, earned from, for example, cultivating the land, keeping animals, running mills and wild bee-keeping. The expenses connected with maintaining buildings, paying royal officials and servants as well as the costs of services were also included. No expenses connected with managing the woods are recorded though there was a primeval forest or woodland in the vicinity of many of the places. The forests are mentioned only if there were swarms of bees in the trees, which were a natural source of honey. However, the best illustration of the attitude of the royal property authorities and the surveyors'

*średniowiecznym (Timber as a Building Material in Teutonic Prussia. A Contribution to Studies into the Role of Timber in Medieval Architecture.)*, [in:] *Zabytkowe budowle i drewnianastolarka architektoniczna wobec współczesnych zagrożeń*, Toruń 2005, pp. 97-111.

<sup>6</sup> A. Żabko-Potopowicz, *op. cit.*

<sup>7</sup> O. Rackham, *op. cit.*, London 1990, p. 77.

<sup>8</sup> *Dokument opatowski z 1381 r. (The Opatów Document of 1381)*, [in:] *Metryka Koronna* 71.

<sup>9</sup> H. Samsónowicz, *Struktura handlu gdańskiego w pierwszej połowie XV wieku (The Structure of Gdańsk Trade in the First Half of the Fifteenth Century)*, [in:] „Przegląd Historyczny”, Vol. LIII, fasc. 4, pp. 694-695.

<sup>10</sup> N. E. Bang, *Tabeller over skibsfart og varentransport gennem Rresund 1497-1660*, København 1922.

attitude to the forest economy was the description of the village of Łubianka situated near Ujście on the Noteć River. "Puszczej mil 4, borów i dąbrów, z których żadnego pożytku nie masz pieneznego (four miles of wilderness, forest and oak woods, which do not generate any profit)", says the record<sup>11</sup>. Among all the inventories there are only two mentions containing information about any form of active forestry. In Sokolniki, provincial District of Wieluń, there was "urzednik samowtorny co roboty i lasow przyglada", (an officer and his helper who look after the work and the forests)<sup>12</sup>. Therefore the local woods in the area were under constant control and the officer was one of the best-paid officials in the *starosta's* district. The second mention refers to a small forest in Winiary near Kalisz, which was grown to supply wood for building fences probably surrounding fields and grazings<sup>13</sup>. The last mention is of great significance to us. Fences are usually built from poles made from young trees, less than twenty years old. The existence of such a grove might mean that a special species of tree, most probably the pine, was selected to be planted or seeded and subsequently cut down and replaced with new seedlings. Such procedure would suggest that some steps of economic value, consisting in purposeful planting and cutting down trees at the right stage of the cycle of forest development, were taken in the case of the woodland in question. It could, however, be assumed that this was a sporadic practice or that such cases were hardly ever mentioned in written sources. Thus, this instance of conscious management cannot be considered evidence of the fact that forestry consisting in planting or seeding vast areas of woodland, at least 1 hectare in area, in order to harvest commercial timber, was widespread in sixteenth century Poland. It should also be noted that it would have taken more than a hundred years for the trees to grow<sup>14</sup>.

However, it appears that the above reservation can be questioned. In the autumn of 2004, during renovations to the attic of St Andrew's parish

church in Łęczyca, Łódź province, central Poland timber samples were taken for dendrological and dendrochronological analysis. The samples came from the roof timbers of the church and they were obtained thanks to the kindness and consideration of Rev. Zbigniew Łuczak, the dean of Łęczyca and the local parish priest. The aim of the analysis was to establish the precise age of the roof rafter framing as well as to characterize material used to build it. Classical dendrochronological methods, whose application to dating architectural monuments has frequently been described by Hoffsummer<sup>15</sup>, Simpson and Litton<sup>16</sup>, Ważny<sup>17</sup>, Wrobel and others<sup>18</sup>, were used.

Let us examine the research procedure and its results in detail.

### Research material and methods

Dendrochronology is a method based on the analysis of tree-ring sequences. In the case of timber structures, samples with visible tree-ring width variability from the youngest, circumferential, to the oldest, central, should be analyzed. In order to obtain reliable material, samples were taken by means of specialized cylindrical borers for dry wood from selected sections of the rafter framing. The core samples were subsequently analyzed in the laboratory. Measurement areas were selected and prepared for analysis and tree-ring widths were measured by means of LINTAB measuring stage. The accuracy of the measurement was 0.01 mm. The tree-ring sequences were synchronized and compared with standard chronologies using the following programs: CATRAS v. 4.20 (ANIOL 1980-2003), TSAP (Rinn 1996) and DENDRO for WINDOWS (Tyers 2004). A comparison of a

<sup>15</sup> P. Hoffsummer, *Les Charpentes du XI<sup>e</sup> Au XIX<sup>e</sup> siècle, typologie et evolution en France du Nord et en Belgique*, Paris 2002.

<sup>16</sup> W. G. Simpson, C. G. Litton, *Dendrochronology in Cathedrals*, [in:] *The Archaeology of Cathedrals*. Oxford Univ. Comm. For Archaeol. T. Tatton-Brown, J. Munby, eds. 42, 1996, pp. 183-209.

<sup>17</sup> T. Ważny, *Dendrochronologia obiektów zabytkowych w Polsce (Dendrochronology of Historic Objects in Poland)*, Gdańsk 2001.

<sup>18</sup> S. Wrobel, J. Chr. Holst, D. Eckstein, *Holz im Hausbau – Dendrochronologisch-bauhistorische Reihenuntersuchungen zum Hausbau des 13.-17. Jahrhunderts in Lübeck*, [in:] *Wege zur Erforschung städtischer Häuser und Höfe*, R. Hammel-Kiesow ed., Neumünster, 1993, pp. 183-249.

<sup>11</sup> *Lustracja województw wielkopolskich i kujawskich 1564-1565 (The Survey of 1564-1565 of the Provinces of Great Poland and Kujawy)*, ed. A. Tomczak, Cz. Ohryzko-Włodarska, J. Włodarczyk, part 1, Bydgoszcz 1961, pp. 146-147, also cf.: p. 169.

<sup>12</sup> *Ibidem*, p. 80.

<sup>13</sup> *Ibidem*, p. 213.

<sup>14</sup> According to modern norms for pine timber used in building.

tree-ring sequence and the corresponding standard makes it possible for the researcher to establish the year when the tree was cut down as long as the outside surface has been preserved intact. A total of sixteen structural elements were examined. The whole rafter framing was made from Scots pine (*Pinus sylvestris* L.).

A complete list of samples and detailed analysis results are shown in Table 1 below.

### Dendrochronological results and their interpretation

Among the sixteen wood samples, fourteen were successfully dated and the age of seven of them was established with one-year accuracy. Most of the timbers used in the rafter framing over the presbytery were chopped down in the autumn of 1729 or the winter of 1729/1730. The youngest structural part, namely truss beam no. 10 is evidence that the structure was built in 1732.

The dating results suggest that the building materials were gathered for several years from 1728 onwards. Corner rafter no. 13 comes from the year 1710, which might mean that timber could be reused or that pieces of timber which had not been used before came in handy during the present construction works. The span of ring sequences is illustrated in the timber diagram shown below (Fig. 1).

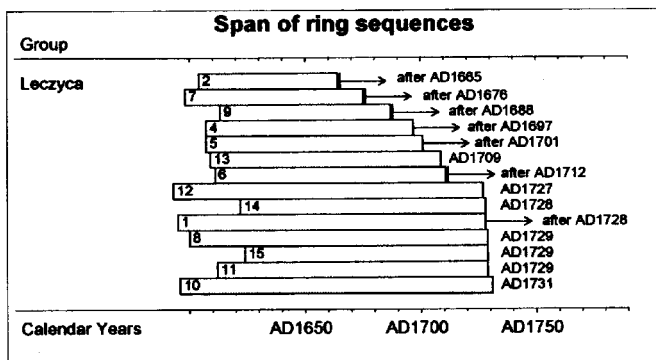


Fig. 1. Dating structural parts of the rafter framing from the church at Łeczyca.

Dating the oldest annual rings of the samples preserved and the estimated distance of these rings from the pith leads to the conclusion that the pine trees used in the building of the church were about 140 years old. In addition, while calculating the age of a tree, the distance of the place from which the sample was taken from the tree trunk base must be taken into consideration. As a result of a tree's growth, the age of the pith decreases in relation to the tree's height. This parameter is much more difficult to establish but as a rule the

samples were taken from the places which were biggest in diameter so that the maximum number of annual rings could be obtained. These places were usually the ones closest to the tree base. The only exceptions were the timbers where the bark ring was missing. In such cases, samples were taken from places which were further away from the tree trunk base.

Let us now examine in detail the way the trees grew. The tree-ring rhythm is illustrated in the following diagrams (Fig. 2). In the case of annual ring sequences, the classical age trend resulting from the fact that as the diameter of the tree trunk was growing with age, the growth in thickness was gradually decreasing and the amount of wood mass remained the same, was clearly visible. The rings from the early years were very wide (over 4-5 mm), which means that the young trees grew freely and had unlimited access to daylight. No symptoms of competition between the trees or signs of domination by other, older trees were found. In 1616, all the young trees as well as the whole woodland area were affected by some harmful factors, which is visible as a characteristic peak in their ring sequence curves. In the years 1648-1649, there was a serious decrease in the growth of the trees, which was reflected in unusually narrow rings. In the case of the trees from which samples 7 and 8 were taken, the fall continued in 1650. The fact that in the case of beam 7, one ring from the years 1648-1650 is missing is evidence of the strength of the stress-causing factor. Under the circumstances, the tree was unable to produce a new ring.

A number of beams made from pine trees which seeded themselves or were planted over a few years around 1590 can be found in the roof structure of St Andrew's church in Łeczyca. The trees were all cut down in the autumn of 1729 and the autumn and winter of 1729-1730, that is to say, in the period most suitable for cutting down trees to be used as timber. We are of the opinion that the above situation might be considered evidence of planned forestry. It is known that trees which are exactly the same age and grow in the same woodland area differ in size in the same growth period. Consequently, a group of a dozen or so footing beams identical in length and diameter made from a number of trees being the same age were only part of the whole tree population in question. It should be assumed that in the woodland area from which the footing beams used for the structure came, there must have been more pine trees of the

