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GRAIN YIELDS IN POLAND, BOHEMIA, HUNGARY, AND SLOVAKIA IN THE 16TH TO 18TH CENTURIES*

THE DEVELOPMENT OF RESEARCH

The development of studies on grain yields, which has taken place over the past fifteen years or so, is of capital importance inasmuch as in the feudal period agriculture was the principal area of economic activity by man. The efficiency of this activity, and to consider it more broadly — that of the productivity of human labour, for centuries was decisive in regard to the basis of the material welfare of the population and the economic position of the state, and hence its political power. B. H. Slicher van Bath[1] compiled the results of these studies several years ago. The publication by this eminent scholar of the agrarian history of Western Europe also covered Central and Eastern Europe, but to an insufficient degree. It is true that the results of Polish studies are represented in that publication and, indeed, they constitute more than 20 per cent of all the yield ratios tabulated by the author; however, when it comes to Bohemia and Slovakia, for instance, we find there only a reference to two articles (F. Lom and P. Horvath),[2] although Czechoslovak science had many more

* A lengthier version of this article is to appear in the "Kwartalnik Historii Kultury Materialnej", vol. XVIII, 1970, No. 2. More detailed tables with yield ratios will also be published there. The present article refers to our article *Ze studiów nad wysokością plonów w Polsce od XVI do XVIII w.* [*From Studies on the Size of Yields in Poland from the 16th to 18th Centuries*], *ibidem*, vol. XIV, 1966, No. 3, pp. 457 - 490. Résume cf. *Third International Conference on Economic History 1965*, vol. II, Paris 1970, pp. 149 - 170.

[1] B. H. Slicher van Bath, *Yield Ratios 810 - 1820*, "A. A. G. Bijdragen," vol. X, 1963; cf. also W. G. Haskins, *Harvest Fluctuations and English Economic History 1480 - 1619*, "Agricultural History Review," vol. XII, 1964, pp. 28 - 46; J. Jacquart, *Production agricole dans la France du XVII^e siècle*, "XVII^e Siècle," 1966, No. 70 - 71, pp. 21 - 46; E. Le Roy Ladurie, *La production agricole en France (XV - XVIII) notamment d'après les dîmes* (mimeo.).

[2] B. H. Slicher van Bath, op. cit., pp. 51 - 185. We could not make use

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papers in this field before 1963. Nor do we find any results at all from studies by Hungarians, although historians of that country have taken an interest in this subject since 1930.[3]

Studies on yields, in Poland as well as in Czechoslovakia and Hungary, have yielded much new material since the publication of the work by Slicher van Bath (1963). Soviet science has also been taking a growing interest in yields. In this paper we shall try to make use of the results of Soviet studies concerning territories which once were part of the Polish Kingdom (Byelorussia, Podolie, Volhynia, the right-bank Ukraine).[4]

Let us, therefore, proceed to a discussion of the state of studies in countries of direct interest to us. It would seem that greater possibilities, as far as sources are concerned, are to be found precisely in those countries where feudal latifundia predominated and where the manor developed on a large scale. The grain accounts of manors constitute the principal basis of these studies; these accounts were not kept by peasants nor, as a rule, by nobility with small or medium-sized estates. Only in the archives of latifundia can bits, or even long series, of accounts be found. Approximate information about yields, based on estimates, can frequently be found in all sorts of descriptions and taxation of domains such as inventories, registers, farming instructions and orders, and in the agricultural literature. Nevertheless, only accounts can constitute a basis for systematic studies.

Polish science has taken an interest in yields in feudal agriculture for quite some time (R. Grodecki 1919, R. Rybarski 1931).[5] J. Rutkowski dealt with the yields, or to be more precise, with the percentage of grain al-

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of this author's *De oogstopbrengsten van vershillende gewassen, voornamelijk granen, in verhouding tot het zaaizaad ca. 810 - 1820*, "A. A. G. Bijdragen," vol. IX, 1963, pp. 29 - 125, nor of the English version of this study in "Acta Historiae Neerlendica," vol. II, 1967, pp. 26 - 106.

[3] Cf. Zs. Kirilly, L. Makkai, J. N. Kiss, V. Zimanyi, *Production et productivité agricoles en Hongrie à l'époque du féodalisme tardif (1550 - 1850)*, in: *Nouvelles études historiques publiées a l'occasion du XII Congrès International des Sciences Historiques par la Commission Nationale des Historiens Hongrois*, vol. I, Budapest 1965, pp. 586 - 588, where previous works from this field are cited.

[4] A. J. Baranovič, *Magnatskoe hozjaistvo na Juge Volyni v XVIII v.* Moskva, 1955, pp. 45 - 56; V. A. Markina, *Magnatskoe pomest'e pravoberežnoj Ukrainy vtoroj poloviny XVIII v.*, Kiev, 1961, pp. 93 - 100; N. G. Krikun, *Urožajnost' zernovyh kul'tur v fol'varkah severnoj časti podol'skogo voevodstva v pervoj polovine XVIII v., Ežegodnik po agrarnoj istorii Vostočnoj Evropy 1962*, Vilna, 1964, pp. 326 - 336; P. G. Kozlovskij, *Dinamika urožajnosti i posevnyh ploščadej v XVIII — I pol. XIX v., Ežegodnik po agrarnoj istorii Vostočnoj Evropy 1964*, Kišinev, 1966, pp. 34 - 365.

[5] R. Grodecki, *Przyczynki do dziejów rolnictwa* [*Contributions to the History of Agriculture*], reprint from "Tygodnik Rolniczy" 1919, No. 36, pp. 20 - 22; R. Ry -

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located for sowing, as an indicator of the level of farming.[6] However, this scholar, the most prominent historian of the rural economy, in the interwar period in Poland, did not personally engage in detailed studies of yields. It was not until the 1950's that systematic studies were undertaken. However, before they yielded results and before a wealth of factual material was compiled, a schematic treatment of the dynamics of yields in the period of interest was developed in the acceptance of certain general, uniform yield ratios for longer periods of time.[7]

A. Wawrzyńczykowa, who herself *magna pars fuit*, discussed the results of Polish studies.[8] A few years later the results were compiled by the present author.[9] More recently, this has been done by A. Wyczański who has pointed out controversial issues in the realm of research methods.[10] He presented studies on yields in Poland for the first time at an international forum (Stockholm 1960).[11] I. Rychlikowa not only examined the yields in many estates in Little Poland in the years 1764 - 1805, but also successfully tried out research methods based on the elements of

barski, *Gospodarstwo księstwa oświęcimskiego w XVI w.* [*The Husbandry of the Oświęcim Principality*], Kraków 1931, pp. 12 - 20.

[6] J. Rutkowski, *Przebudowa wsi w Polsce po wojnach z poł. XVII w.* [*The Reconstruction of the Polish Countryside after the Wars of the Mid-17th Century*], *Studia z dziejów wsi polskiej XVI - XVIII w.* [*Studies on the History of the Polish Countryside 16th - 18th Centuries*], Warszawa 1956, p. 95.

[7] Cf. J. Topolski, *Gospodarstwo wiejskie w dobrach arcybiskupstwa gnieźnieńskiego od XVI do XVIII w.* [*Rural Husbandry on the Estates of the Gniezno Archbishopric from the 16th to the 18th Century*], Poznań, 1958, p. 217; *Zarys historii gospodarstwa wiejskiego w Polsce* [*An Outline History of the Rural Economy in Poland*], vol. II, Warszawa 1964, pp. 176 - 178; W. Szczygielski, *Le rendement de la production agricole en Pologne du XVI - XVIII[e] s. sur le fond européen*, "Kwartalnik Historii Kultury Materialnej," vol. 14, 1966, Ergon, vol. V., pp. 796 - 798; cf. J. Rychlikowa, *Dwie książki o gospodarstwie magnackim na Ukrainie Prawobrzeżnej w XVIII w.* [*Two Books on Magnate Husbandry in Right-bank Ukraine in the 18th century*], "Przegląd Historyczny," vol. LIX, 1968, No. 1, p. 149; A. Wyczański, *O badaniu plonów zbóż w dawnej Polsce* [*On the studies of grain yields in old Poland*], "Kwartalnik Historii Kultury Materialnej," vol. XVI, 1968, No. 2, p. 254.

[8] A. Wawrzyńczykowa, *Stan badań nad wysokością plonów w rolnictwie polskim w XVI - XVIII w.* [*The State of Studies on Yields in Polish Agriculture in the 16th - 18th Centuries*], "Kwartalnik Historii Kultury Materialnej," vol. VIII, 1960, No. 1, p. 103 - 117.

[9] L. Żytkowicz, *Ze studiów nad wysokością plonów w Polsce od XVI do XVIII w.* [*From Studies on the Size of Yields in Poland from the 16th to the 18th Centuries*], "Kwartalnik Historii Kultury Materialnej," vol. XIV, 1966, No. 3, p. 466 - 471.

[10] A. Wyczański, op. cit., pp. 251 - 269.

[11] A. Wyczański, *Le niveau de la récolte des céréales en Pologne du XVI au XVIII s.*, Première Conférence Internationale d'Histoire Économique. Contributions. Communications, Stockholm 1960, pp. 585 - 590.

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economic statistics.[12] The achievements of Polish scholars in this domain should be appraised as highly important in regard to both the material collected and the methods employed. There seems to be a need, however, for a more systematic plan of studies based on exhaustive records of the basic source material — manorial grain accounts.

Czech historians set about conducting studies on yields on a large scale in 1949 - 1950 under V. Černy; five archivists noted the harvests of the 18th and 19th centuries, thus realizing in part the desire of this scholar to study yields from the 15th century to the present day.[13] As far as we know, there have been no publications on those studies. A series of studies on these problems was opened by a paper by A. Mika on manorial husbandry in the 14th to 17th centuries.[14] Shortly after that, a study was published by V. Černy on an examination of the causes of variations in yields,[15] and a study was published by F. Lom on the development of the area sown from the 16th to 18th centuries.[16] These papers by A. Mika and F. Lom were based on the manorial archives of magnates' estates, especially Rožmberk (later Schwarzenberg) and others, mainly in southern Bohemia. Much material was brought by the studies of J. Křivka concerning the Roudnice estate in northern Bohemia.[17] J. Petraň dealt with agricultural production as a whole, and especially with plant production, in Bohemia in the period 1550 - 1620,[18] while J. Valka did the same for Moravia in the period before Běla Hora.[19] However, J. Petráň did not compile much new numerical data concerning yields, and J. Valka had none at all. Moreover, Czech historians are interested primarily in the period prior to 1620. An exception is a study by J. Křivka devoted to the first half

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[12] I. Rychlikowa, *Produkcja zbożowa wielkiej własności w Małopolsce w latach 1764 - 1805* [*Grain Production on Large Estates in Little Poland in 1764 - 1805*], Warszawa 1967.

[13] V. Černý, *Historický výzkum příčin kolisání sklizní*, "Historie a musejnictví," vol. I, 1956, pp. 160 - 166.

[14] A. Mika, *Feudálni velkostatek v Jižnich Čechách (XIV - XVII stol.)*, "Historický Sborník," vol. I, 1953, pp. 122 - 213.

[15] V. Černý, op. cit., pp. 159 - 176.

[16] F. Lom, *Vývoj osevnich ploch obilnin a sklizní od XVI st. w Čechách*, "Historie a musejnictví," vol. II, 1957, No. 3, pp. 161 - 174; F. Lom, *Historický vývoj osevních ploch plodin v Čechách od roku 1756*, ibid., No. 1, pp. 43 - 48.

[17] J. Křivka, *Ranský dvůr v I čv. XVII st.*, "Časopis Společenství Přatel Starožitností," vol. LXIV, 1956, pp. 89 - 102; J. Křivka, *Roudnický velkostatek na sklonku XVI st.*, "Historie a musejnictví," vol. I, 1956, pp. 117 - 136, 195 - 204, 237 - 248.

[18] J. Petráň, *Zemědělska výroba v Čechách v druhé polovině 16 a počátkem 17 století*, Praha 1963.

[19] J. Válka, *Hospodářská politika feudálního velkostatku na Předbělohorské Moravě*, Brno, 1962.

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of the 18th century.[20] In other works, on the other hand, we find only scattered figures about yields. As a rule there are no long series of figures, although the state of some manorial archives would permit them to be given.[21] Slovak historians have also been interested in yields in large local latifundia.[22]

As mentioned earlier, in Hungary back in 1930 papers began appearing with tables of yields in some estates in the period of late feudalism. In 1965 a team study was published and in it use was made of results from earlier studies and new results were presented. This study comprises more than 1,300 yield ratios from the mid-16th century to the end of the 18th century, not to mention later data, almost entirely from West and North-east Hungary — excluding the territory occupied by the Turks until the end of the 17th century — and from Slovakia.[23] These are not always long series. The authors confined themselves to yield ratios for the grains, without giving the acreage sown or the harvest. At the same time, there appeared a work by G. Perjés, devoted to a method of studying yields in the 19th and 20th centuries, that is, at a time when the conditions with regards to sources are completely different from those of feudal times.[24]

In general it may be said that studies of yields conducted hitherto have been confined to the manorial farms of big estates. This restriction has been imposed by the extent and character of the source materials, as mentioned earlier.[25]

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[20] J. Křivka, *Přispěvek k dějinám poddanského hospodařeni v prvni pol. XVIII st.*, "Historie a musejnictví," vol. II, 1957, pp. 79 - 94, 301 - 320.

[21] Cf. E. Janoušek, *Historický vývoj produktivity práce v zemědělství v období pobělohorském*, Praha, 1967, pp. 48 - 55. Unfortunately, some investigators confine themselves to giving long-term average yields instead of tabulating series of annual ratios, e.g. F. Lom, *Vývoj osevnich ploch...*, p. 169.

[22] A. Kavuljak, *Lietava. Podnik feudálneho hospodařskeho systemu*, Turč. sv. Martin, 1948; J. Vatzka, *Vývin majerského hospodárenia na trenčianskom a bánovskom panstve od polovice 16 do konca 18 st.*, "Historicke Štúdie," vol. I, 1955, pp. 50 - 104; P. Horváth, *K dejinám pol'nohospodárskej výroby na Slovensku v prvej polovici 18 stor., ibidem*, vol. VI, 1960, pp. 215 - 262; F. Sedlak, *Obilna produkcja a výnos pôdy na panstváh Šintava, Čeklís a Čathice v druhej polovici 18 a v prvej polovici 19 storočia, ibidem*, vol. XIII, 1968, pp. 29 - 50.

[23] Cf. footnote 3; this also includes ratios published simultaneously by V. Zimányi, *Gabona terméseredmények a Batthyány uradalmakból (XVII - XIX sz.), Történeti statisztikai évkönyv 1963 - 1964*, Budapest, 1965, pp. 236 - 275. We are not certain whether or not there have been recent publications on this subject which we have been unable to reach.

[24] G. Perjés, *Terméseredmeny-Vizsgalatok, ibidem*, pp. 128 – 172.

[25] For the possibilities of studies on the production (not yields) of the peasant economy on the basis of lists of tithes, see Zs. Kirilly and N. I. Kiss, *Production de céréales et exploitations paysannes en Hongrie aux XVI et XVII siècles*, "Annales Économies-Sociétés-Civilisations," vol. XXIII, 1968, No. 6, pp. 1211 - 1236.

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CONTROVERSIES AS TO METHODS

Studies of yields are not, of course, free from doubts and controversies as to method. The principal ones are:

1. The way of expressing the yield: should it be presented "in seeds," as it appears in the sources of the period under study, or in the manner accepted in studies on modern agriculture, that is, in quintals per hectare (q/ha).

2. The usefulness of unit yield ratios (the yield of one seed on one farm in one year) and group ratios, i.e. showing either the size of the yields on a number of farms in one year, or on one farm over a period of several years, or else on several farms over several years.

3. The usefulness of individual ratios and chronological series.

4. The usefulness of yield ratios computed on the basis of sources of different types.

Ad 1. As is known, in studies on modern agriculture the yield of a given unit of land (ha), expressed in quintals, is the measure of the level of agriculture. On the other hand, the sources (accounts) of the feudal period usually express the extent of sowing in terms of the amount of grain sown, while rarely taking any interest in the area planted. Attempts to convert the grain sown into area sown are hindered by the fact that sowing density, i.e. the proportion of grain sown to area sown, was not uniform. These attempts have thus proved to be deceptive or, in any case, it is desirable to avoid them wherever such conversions do not have to be used.[26]

This is not a question solely of research technique and quantitative errors. Both methods of expressing yields, that is, in seeds and in q/ha, are specific to the two different periods in agriculture. The former for extensive feudal husbandry when yields were low and, hence, a high percentage of the grain harvested had to be earmarked for sowing. The concept of area sown is not equivalent to what we take this to mean today. A considerable fraction of the fields became fallow and yet they should be classified as part of the tilled area; because winter crops were des-

[26] Cf. B. Baranowski, *Sprawa metody badań historycznych nad strukturami zasiewów* [*The Question of the Method of Historical Studies on the Structure of Sowing*], "Kwartalnik Historii Kultury Materialnej," vol. XIV, 1966, No. 3, pp. 539 - 543. This subject has been taken up at length by I. Rychlikowa who has taken a critical attitude towards attempts made thus far to calculate the cultivated area on the basis of the amount of grain sown: I. Rychlikowa, *W sprawie modernizacji warsztatu historyka rolnictwa* [*On the Modernization of the Working Methods of the Agricultural Historian*], "Kwartalnik Historii Kultury Materialnej," 1968, No. 1, pp. 4 - 24, 31 - 36.

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troyed, more frequently than is the case today, the same area was re-sown with spring grain. The existence of a reserve of unused land facilitated extension of the cultivated area if necessary.[27] For that reason, grain and not land was the decisive item in production costs. Acceptance of the ratio of grain harvested to grain sown as a measure of yields is in accordance with the Polish and foreign literature.[28] Any other procedure is an exception.[29]

Ad 2. Grain accounts make it possible to calculate the individual as well as group yield ratios.[30]

A. Wyczański recently drew attention to the difficulties and complications entailed in computing the so-called mean yields for large areas: the arithmetic mean of yields is misleading; only knowledge of the sowings and harvests of comparable aggregations makes it possible to calculate the proper mean ratio. However, the author regards the spread of yields as a problem which, in a sense, is secondary, ancillary.[31] Such a viewpoint may arouse some objections. Variations and instability of yields testify to a low level of agrarian technique, expose the vast risk of production, and hence project onto the entire economy of the agriculture of the time; account must be taken of the economic effects as well as the causes of the phenomenon. On the other hand, one can agree with the author when he comes out in favour of using simpler research methods, and abandoning concepts which are not very decipherable to the historian, and doing way with tedious calculations. In the opinion of the author, it is sufficient to give the percentage of ratios which deviate significantly from the mean.[32] This latter suggestion might be regarded as correct if the analysis con-

[27] Cf. I. Rychlikowa, op. cit., pp. 28 - 29.

[28] Cf. e.g. B. H. Slicher van Bath, op. cit., pp. 30ff; Zs. Kirilly, et al., op. cit., pp. 582, 586.

[29] This has been postulated by V. Černý, *Historický vyzkum příčin kolísáni sklizní*, "Historie a musejnictví," vol. I, 1956, pp. 170 - 171. Cf. H. H. Wächter, *Ostpreussische Domänenvorwerke im 16. und 17. Jahrhundert*, Würzburg, 1958, pp. 111ff.; F. Lom, *Vývoj osevních ploch obilnin a sklizní od 16 století v Čechách*, ibid., vol. II, 1957, pp. 165 - 174; W. Achilles, *Die Getreidewirtschaft der Kirche zu Hedeper und Bornum, krs. Wolfenbüttel*, "Zeitschrift für Agrargeschichte und Agrarsoziologie," Jrg. VIII, 1960, H. 1, pp. 139ff. We could not use the results of these investigations since they cannot be converted into yield in grains. The method of calculating yields in grains has also been supported by E. Le Roy Ladurie, *La production agricole en France (XV^e - XVIII^e siècle) notamment d'après les dîmes*, p. 2 (mimeo.).

[30] Terms used by A. Wyczański, *O badaniu plonów zbóż* [*On the studies of grain yields*], p. 253. The group ratio is taken to mean the weighted mean of yields, either on many farms or on one farm but over a number of years.

[31] A. Wyczański, op. cit., pp. 253 - 259.

[32] *Ibidem*, p. 258.

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cerned yields obtained on an exactly defined area in which all the existing farms could be encompassed by the studies, e.g. royal manorial farms in Sandomierz Voivodship in 1564/65.[33] But how can one compute the mean yield for the entire country, or at least for some region? After all, we do not have, nor shall we ever have, data concerning all of the farms there. For this reason, it is our opinion — despite the critical remarks — that the method which is most accessible from the research point of view is to seek a "typical yield," i.e. the one that appears most frequently. Such a treatment of the problem permits use of all ratios, be they the most scattered, referring to different years and different farms, as well as ratios of unknown weight.[34] The results of the calculations may, of course, be subject to change under the influence of further searches and extension of the research base. We should bear in mind that in regard to studies on yields in the feudal era we are still in the stage of collecting material.

It would no doubt be most advisable to arrange the yield ratios, particularly the unit yield ratios, according to a scale of size. The points of greatest "density" would represent the most common yields. However, the data available to the historian are only approximate and not exact, so we deem it more practical to "round off' the ratios in a sense, i.e. to distribute them in intervals rounded off to whole numbers, e.g. from 1 to 2, 2 to 3, etc. Attention has been drawn to the risk involved in this procedure when the ratios are low since it is important whether the yield is 2.1 or 2.9 seeds, especially when we do not have a large number of ratios. On the other hand, however, for a small number of ratios, strictly speaking no method leads to reliable results. The risk falls off when the ratios are more numerous.[35] An argument in favour of such "rounding off" of the ratios also is the fact that it is not always possible to determine whether they were calculated after deduction of the church tithe, or whether they also include the tithe grain. And there are also cases when the tithe was not collected at all, e.g. in the case of some church estates, or was replaced by a monetary payment. The resultant error from this rarely exceeds 0.5 seed.

Ad 3. There is no doubt as to the greater usefulness of long series of yield ratios since they best enable fluctuations and variations in the yields to be observed. As stated above, only in exceptional cases does the investigator have such data available for the period prior to the mid-18th century in Poland. As far as we know, the situation in Bohemia is better

[33] *Ibidem*, pp. 258 - 259.

[34] Cf. the reservations of A. Wyczański, op. cit., p. 285, to comparison of yield ratios of varying weights. The doubt is in principle justified but the danger of distorting reality decreases for a larger number of ratios.

[35] A. Wyczański, op. cit., p. 255.

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in this respect, but studies to date have not yielded any abundance of material. Such series have appeared in Hungary since the beginning of the 18th century.[36] All of this indicates a need to make use also of scattered ratios, referring to various years and different farms. Of course, this state of affairs limits the possibilities of analysis. However, it does make it possible to look for typical ratios, those which appear most frequently.

Ad 4. In general, the usefulness of grain accounts has not been questioned, although naturally they, too, may arouse well-founded mistrust owing to the possibility of embezzlement and a tendency to conceal the actual state of affairs. Then again there is the difficulty which stems not so much from the system of accounting at the time but from the conditions of farming. At times the threshing dragged out past the farming year. In this case, apart from the harvest in sheaves the accounts could well record the threshing actually done in the given year. I. Rychlikowa describes this as "yield realized."[37] The source does not always make it possible to distinguish between threshings of crops from the current year and from previous years.[38] In view of this, at times when calculating yield ratios, authors employ the ratio of threshing yield to amount sown instead of the harvest to the amount sown,[39] without always making it clear whether the sources made it possible to establish the latter, or just the former.[40]

Of course, calculation of crops on the basis of the ratio of threshing yield to amount sown distorts the real picture, especially when the difference between the number of sheaves threshed and the number har-

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[36] Zs. Kirilly, et. a l., op. cit., pp. 596 ff.

[37] I. Rychlikowa, *Produkcja zbożowa wielkiej własności w Małopolsce w l. 1764 - 1805* [*Grain Production on Large Estates in Little Poland in 1764 - 1805*], Warszawa 1967, pp. 75 - 77, and footnote 1; cf. V. Černý, op. cit., p. 170.

[38] This was possible, for instance, when it concerned the grain accounts of the estates of the Włocławek Bishopric for 1531 – 1534; cf. L. Żytkowicz, *Studia nad gospodarstwem wiejskim w dobrach kościelnych XVI w.* [*Studies on the Rural Husbandry on Church Estates in the 16th Century*], Warszawa 1962, pp. 242 - 243.

[39] I. Rychlikowa, op. cit., pp. 76 - 77, and her review of the work by W. Serczyk, *Gospodarstwo magnackie w województwie podolskim w II poł. XVIII w.* [*Magnate Husbandry in Podolian Voivodship in the Second Half of the 18th Century*], Wrocław 1965; "Przegląd Historyczny" vol. LIX, 1968, No. 1, p. 148, footnote 23; cf. W. Serczyk, op. cit., p. 72. We shall use the term harvest to describe the total amount of grain obtained from a given year's crop, regardless of whether or not threshing took place in the given economic year or later.

[40] Cf. B. Baranowski, *Wysokości plonów w końcu XVIII i początkach XIX w. w dobrach nieborowskich* [*The Size of Yields at the End of the 18th and the Beginning of the 19th Century on Nieborów estates*], "Rocznik Łódzki," vol. I, 1958, pp. 15 - 19; cf. also I. Rychlikowa, *Produkcja zbożowa* [*Grain Production*], p. 77, footnote 1.

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vested was considerable. It is not possible, however, to check all the calculations, or to eliminate ratios based on the relation of threshing yield to amount sown. Consequently, it is necessary to consider whether or not they may also be useful for studies on yields? Many-year ratios, based on the relation of threshing yield to amount sown, as those based on harvest to amount sown, will undoubtedly not differ essentially since the differences stemming from both the fact that part of the crop was left in sheaves and the fact that left-over crops from previous years were threshed should cancel out. After all, the overall quantity of grain produced did not in principle change because the threshing was dragged out. In the case of long series of one-year ratios, it may seem that the scale of fluctuations in the yields increases since in a year when not all of the crop was threshed the accounts will show a lower yield than the real one; and conversely, in a year when left-over crops from previous years were threshed in addition to the current year's, the accounts will show a higher yield than the actual one.[41] The conclusion is that perhaps a smaller weight should be assigned to the highest as well as the lowest yield ratios, this being especially true in regard to the former. In the event of a higher demand for grain, larger quantities of the crop from previous years were threshed. And even if "disperse" ratios are used, i.e. individual ratios from different years and farms, the differences stemming from the fact that they will include a number of ratios based on threshing-to-sowing ratio should cancel out to some extent, inasmuch as these differences go in both directions: plus and minus. Generally speaking, we feel it acceptable to use the threshing-to-sowing ratio, and not only the harvest-to-sowing ratio, in studies on yields, but it must be borne in mind that the former may increase the scale of fluctuation of yields.

On the other hand, it seems to us to be more controversial to employ ratios based on data from the inspection of royal estates. For they may be a reflection of one-sided trends, e.g. when — instead of presenting the actual yields — the inspecting commissions gave attainable yields, which were not always attained in actual fact,[42] or when they accepted a general scheme.[43] For that reason, as in the case of our previous article on yields in Poland, we shall omit yield ratios based on inspection of royal estates.[44]

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[41] I. Rychlikowa (*ibidem*) cites an extreme case of (alleged) yield of 22 grains, calculated on the basis of the relation of threshing yield to amount sown.

[42] Cf. A. Wyczański, op. cit., p. 251, footnote 5. Our reservations concerning inspection of the royal estates as a source for studies on yields have been expressed in the article *Ze studiów nad wysokością plonów...* [*From Studies on the Size of Yields...*], pp. 461 - 466.

[43] For instance, the inspection commission of Sandomierz district of 1789 took for a profit 3 grains as compared to the average amount sown over the 3 years

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COMPARABILITY OF RESULTS

The purpose of the paper is to compare grain yields obtained in Poland, Hungary, Bohemia, and Slovakia. A difficulty arises in this case: each of these countries encompasses regions with different natural farming conditions. It would be ideal to group and intercompare ratios relating to farms with identical soil, climatic, and other conditions. In practice, however, this is not possible. For this reason we are compelled to choose an intermediate road. Let us, therefore, compile ratios for various regions of the former Polish Kingdom, namely: 1) Great Poland and Pomerania, 2) Mazovia and Podlasie, 3) Little Poland, 4) Ruthenia and the Ukraine, 5) Lithuania and Byelorussia, 6) Silesia.

An insufficient number of known ratios prevents each region from being treated separately. The regions mentioned under numbers 1, 2, and 5 are combined by virtue of their similar — though not identical — farming conditions. We have integrated Silesia within its historical boundaries, although the farming conditions were not uniform there.

The Bohemian yield ratios we know of relate mainly to Bohemia proper. In the present case, we can treat it as a unit on an equal footing with the aforementioned territorial units. The few ratios available for Moravia (17th century) are of considerable value owing to the high degree of condensation.[45] (Table 1)

Out of the historical borders of Hungary we separated Slovakia which is an object of attention on the part of Slovak and Hungarian historians alike.[46] The yield ratios concerning the national territory of Hungary refer

preceding the inspection, i.e. in 1786, 1787, and 1788. *Lustracja województwa sandomierskiego 1789* [*Inspection of Sandomierz Voivodship 1789*], Part I, published by H. Madurowicz-Urbańska, Wrocław 1965, pp. 39ff.

[44] "Kwartalnik Historii Kultury Materialnej," vol. XIV, 1966, No. 3, p. 466.

[45] J. Novotny, *Hospodarské poměry na moravském panství novoměstském v době pobělohorském*, "Dejiny Ceskeho Venkova," vol. XX/XXI, 1933 - 1934, pp. 146 - 149; J. Radimský, *Produkce obilí na Moravě na sklonku 16 st.*, "Časopis Matice Moravské," vol. LXXV, 1956, No. 1/2, p. 163; J. Jirasek, *Poddani na panství olomouckého biskupství v II pol. XVII st.*, "Rozpravy Ceskoslovenské Akademie Ved," vol. LXVII, 1957, No. 10, pp. 19 – 20. A total of almost 75 per cent of the ratios lie in the interval 2 - 4. This result is surprisingly in agreement with the cadastre of Maria Theresa for 1749/54 which divided all the cultivated land into 8 classes. Classes 5 - 8, with a yield of 2.5 - 4.0 (the cadastre did not envisage any yield below 2.5 grains), encompassed 77.91 per cent of the arable land. J. Radimský, J., op. cit., p. 165; A. Mika, *Nástin vývoje zemědělské výroby v českých zemich v epoše feudalismu*, Praha 1960, p. 93. Naturally, one might make the quite likely assumption that the figures of the cadastre were low; however, they come from a much later period when there was a general improvement in yields.

[46] Cf. footnotes 3 and 22 above.

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Table 1. Yield Ratios in Moravia

Cereal	No. of estates	No. of manors	No. of ratios	Years	Ratios 0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6
Rye	7	54	15	1606 - 1681	—	—	7	6	2	—
Wheat	6	51	6	1606 - 1678	—	—	2	3	—	1
Barley	6	52	12	1606 - 1681	—	1	4	3	3	1
Oats	6	51	14	1606 - 1681	1	—	6	4	2	1
Total	x	x	47	x	1	1	19	16	7	3
%			100.0	x	2.1	2.1	40.4	34.0	14.9	6.4

mainly to Western Hungary and Northeast Hungary. We omit the few ratios concerning other parts of that country.[47]

In Polish science, the following caesurae have been adopted in the history of the rural economy in the late feudal period: from the end of the 15th century to the 1570's — the so-called period of the development of manorial-corvée husbandry; the years up to the mid-17th century were a period of stagnation, depression and perhaps even regression, ending with vast devastation by war; from the mid-17th century to the mid-18th century- a period of war devastation, the economic effects of which were not overcome until the mid-18th century; and, finally, the second half of the 18th century is regarded as a period of improvement and the beginning of the so-called new agriculture.

A much more fundamental questions looms up, however: can this division also be applied to neighbouring countries which we are comparing? This division is certainly not altogether suitable for them. For Bohemia, for instance, a caesura at about 1620 seems best, owing to the consequences of the Bela Hora defeat had in all fields of public life. In the case of Hungary, it would certainly be proper to take a caesura at the end of the 17th century when the Turkish wars which had been waged in that country ceased. However, it is possible to point out some circumstances which permit the periodical division adopted by us for Polish conditions to be preserved.

This is a periodical division proper to most of the territories embraced by our comparison. The yield ratios concerning Bohemian lands in 1620 - 1650 are very few and, consequently, it will actually change nothing to move the caesura by 30 years. As for Hungary, we have practically no ratios at all from the second half of the 17th century, apart from 1677 and the final years of the century. It therefore seems justifiable to make

[47] Cf. Zs. Kirilly, et al., op. cit., pp. 586 - 590.

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a division into three periods: 1) the 16th century (very few data) and the first half of the 17th century (let us arbitrarily take 1655); 2) the second half of the 17th century and the first half of the 18th; 3) the second half of the 18th century, or strictly speaking, up to 1805 because a series of yields for a number of estates ends in that year.[48] We abandon a caesura at about 1570 in view of the small number of ratios available for the 16th century.

Let us retain the division into individual yield ratios (A) and group ratios (B). The latter may concern both individual years, but two or more farms — manors in the same estates, as well as even longer periods. Some yield ratios for Bohemia have a particularly high degree of condensation; for instance, the Český Krumlov estates in the years 1651 - 1800, in which case each ratio covers 50 years. The same is true in regard to several other estates.[49] Nor are ratios of a high degree of condensation lacking among the others.

Table 2. Distribution of Ratios by Region and Country

Period	Regions and countries*										Total	%
	1	2	3	4	5	6	7	8	9	10		
I	936	196	86	3	64	24	218	16	227	53	1823	18.6
II	43	32	161	217	99	1014	426	46	86	454	2578	26.3
III	152	852	1185	1128	390	900	—	304	368	121	5400	55.1
Total	1131	1080	1432	1348	553	1938	644	366	681	628	9801	100.0

* Regions are numerated as in Tables I, II, III.

The tables cover 9,801 yields ratios for the four main cereals; some 40 per cent are category A ratios, and the remaining 60 per cent or so are in category B.[50] The distribution by regions and periods is uneven.

[48] I. Rychlikowa, op. cit., p. 89. We omit Hungarian yields for 1807 - 1852; cf. Zs. Kirilly, op. cit., pp. 610 - 615.

[49] A. Mika, op. cit., p. 92.

[50] Small differences in regard to figures as compared with the Polish version of the article have resulted from the fact that we have now taken account of three papers not considered there, namely: P. G. Kozlovskij, *Dinamika urožainosti*, cf. footnote 4 above; J. R. Szaflik, *Wieś lubelska w poł. XVII w.* [*The Lublin Countryside in the Mid-17th C.*], Lublin 1963, pp. 148 - 150; S. Kasperczak, *Rozwój gospodarki folwarcznej na Litwie i Białorusi* [*The Development of the Manorial Farm Husbandry in Lithuania and Byelorussia*], Poznań 1965, p. 226.

We could not make use of the book of M. B. Topolska, *Dobra szkłowskie na Białorusi wschodniej w XVII i XVIII w.* [*Szkłów Estates in Eastern Byelorussia in the 17th and 18th C.*], Warszawa 1969, where 161 yield ratios from 1644 to 1715 (pp. 55 - 59) were given.

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On the other hand, the numbers of ratios for the individual cereals are similar: the largest number concerns rye — 2,608, and the least wheat — 2,358, but the difference amounts to not quite 10 per cent.

CLASSIFICATION OF YIELD RATIOS

Let us proceed to a classification of the yield ratios. We do not present detailed tables here, inasmuch as the reader can find them in the Polish version of the article. Information is also given there about the basis of these tables, which have been based on the available literature containing yield ratios for individual estates. The synthetic Tables (Tables I, II, III) appended to this article are intended to make it easier for the reader to get an orientation, and also constitute an attempt at classifying yields. The spread of the ratios is a striking feature. The lower limit most frequently fluctuates about 1, and in exceptions amounts to 3 - 4 seeds. Larger fluctuations are displayed by the upper limit: from 4 (but from 2 in the case of oats) to 10 or even more. As mentioned earlier, this large scale of fluctuations may to some extent be merely apparent: some of the ratios were calculated on the basis of the threshing-to-sowing relation and not on the relation of harvest to sowing. The economic consequences of the fluctuations in harvests must have gone far. The question of the geographical extent of "bumper" years and "poor" years remains an open one. One might well ask how frequently were there general or regional crop failures, and how frequently were there local ones, even on individual estates and farms? [51]

In periods I and II the largest number of ratios fall within the interval 2 - 4, whereas in period III — apart from oats — the higher ratios, from 3 to 6, begin to predominate. Consequently, in order to facilitate analysis we separate three groups of ratios: in periods I and II — 0 - 2, 2 - 4, and 4 or higher (Tables I and II), whereas in period III the division is 0 - 3, 3 - 6, and 6 or higher, for rye, wheat and barley, but for oats it is 0 - 2, 2 - 4, and 4 or higher, owing to the lower yields of this grain (Table III). The middle group, i.e. 2 - 4 in periods I and II and 3 - 6 in period III (oats, 2 - 4), are typical ratios which occur most frequently. The other groups should show the percentage of lower and higher ratios.

The preponderance of ratios of 2 - 4 for wheat and rye in periods I and II is distinct, but is less pronounced in the case of barley. The case

[51] Cf. W. Kula, *Problemy i metody historii gospodarczej* [*Problems and Methods of Economic History*], Warszawa 1963, p. 654; W. Kula, *Teoria ekonomiczna ustroju feudalnego* [*The Economic Theory of the Feudal System*], Warszawa 1962, pp. 72 - 75.

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is similar for oats for which there is a relatively small number of ratios above 4, most frequently amounting to a dozen-odd per cent, whereas ratios below 2 are much more numerous; they are the most numerous group in each of the third cross-sections. The actual yield of oats might have been higher since part of it was used as fodder in unthreshed form.[52]

The tabulation below shows in how many cross-sections each of the aforementioned groups of ratios predominates (comprises more than 50 per cent) or is the most numerous group (Tables 3 and 4).

Period I (Table I): In Great Poland and in Pomerania there is a quite distinct agreement of yields in groups A and B, apart from barley. This circumstance, as well as the substantial number of ratios (936), might testify to the adequacy of our results, namely, the predominance of ratios from group 2 - 4, apart from barley where the percentage of ratios from this group does not exceed 50 per cent. The wheat and barley yields were

Table 3. Distribution of Ratios in Cross-Sections*. Period I and II

Cereal	Period	No. of cross--sections	Predominant ratios of			Lack of predomin-ance	Most numerous ratios of		
			0-2	2-4	4 or more		0-2	2-4	4 or more
Rye	I	8	—	7	—	1	1	7	—
	II	13	1	8	1	3	—	10	3
Wheat	I	10	—	6	1	3	—	9	1
	II	13	—	8	2	3	—	10	3
Barley	I	7	—	—	3	4	—	4	3
	II	12	—	5	2	5	—	7	4
Oats	I	9	1	6	—	2	2	7	—
	II	13	3	6	—	4	5	8	—

Table 4. Distribution of Ratios in Cross-Sections. Period III

Cereal	Period	No. of cross-sections	Predominant ratios of			Lack of predominance	Most numerous ratios of		
			0-3	3-6	6 or more		0-3	3-6	6 or more
Rye	III	14	2	9	—	3	2	11	1
Wheat	III	13	1	7	2	3	1	10	2
Barley	III	13	2	9	—	2	2	10	1
Oats	III	14	1	8	2	3	1	11	2

* Tables 3 and 4 have been compiled on the basis of Tables I, II, III. Cross-section is the name we have given to the whole of the yield ratios from one region in each period.

[52] Cf. L. Żytkowicz, *Ze studiów nad wydajnością gospodarstawa wiejskiego na Mazowszu w XVII w.* [*From Studies on the Productivity of the Rural Economy in Mazovia in the 17th C.*], Warszawa 1969, p. 104.

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Table I. Classification of Yield Ratios According to Frequency Period I

Country or Region	Ratio category	Rye				Wheat				Barley				Oats			
		No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios		
			0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more
1. Great Poland and	A	207	8.2	61.3	30.4	135	8.9	56.3	34.8	217	17.1	42.7	40.1	236	31.8	56.8	11.4
Pomerania	B	58	12.1	65.5	22.4	29	13.8	51.7	34.5	33	27.3	45.5	27.3	21	33.3	57.1	9.5
2. Mazovia and	A	64	23.4	60.9	15.6	25	24.0	44.0	32.0	47	10.6	31.9	57.6	48	68.7	27.1	4.2
Podlasie	B	3	×	×	×	3	×	×	×	3	×	×	×	3	×	×	×
3. Little Poland	A	19	5.3	78.9	15.8	17	11.8	29.4	58.8	20	25.0	25.0	50.0	15	—	73.3	26.7
	B	4	×	×	×	4	×	×	×	4	×	×	×	3	×	×	×
4. Ruthenia and	A	No data available															
the Ukraine	B	3	×	×	×	No data available											
5. Lithuania and	A	16	31.3	62.5	6.2	14	28.6	42.9	28.6	17	41.2	47.1	11.7	17	23.5	52.9	23.5
Byelorussia	B	No data available															
6. Silesia	A	6	×	×	×	3	×	×	×	6	×	×	×	5	×	×	×
	B	1	×	×	×	1	×	×	×	1	×	×	×	1	×	×	×
7. Bohemia	A	44	38.6	36.4	25.0	40	27.5	55.0	17.5	43	9.3	39.5	51.2	38	36.8	44.7	18.4
	B	14	14.3	64.3	15.4	12	8.3	58.3	33.3	15	13.3	46.7	40.0	12	33.3	50.0	16.7
8. Slovakia	A	No data available															
	B	1	×	×	×	11	36.4	36.4	27.3	1	×	×	×	3	×	×	×
9. Western Hungary	A	92	32.6	62.0	5.4	96	12.5	70.8	16.7	9	×	×	×	30	43.3	33.3	23.3
	B	No data available															
10. Northeastern	A	4	×	×	×	21	47.6	52.4	—	7	×	×	×	16	31.2	62.5	6.3
Hungary	B	—	—	—	—	2	×	×	×	1	×	×	×	2	×	×	×

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Table II. Classification of Yield Ratios According to Frequency Period II

Country or Region	Ratio category	Rye				Wheat				Barley				Oats			
		No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios		
			0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more		0 - 2	2 - 4	4 or more
1. Great Poland	A	11	27.3	63.6	9.1	2	×	×	×	11	—	27.3	72.7	11	54.5	45.5	—
and Pomerania	B	2	×	×	×	2	×	×	×	2	×	×	×	2	×	×	×
2. Mazovia and	A	No data available															
Podlasie	B	8	×	×	×	8	×	×	×	8	×	×	×	8	×	×	×
3. Little Poland	A	12	41.7	50.0	8.3	9	44.4	44.4	11.1	12	16.7	66.7	16.7	11	45.5	54.5	—
	B	30	36.7	46.7	16.7	30	26.7	50.0	23.3	27	11.1	59.3	29.6	30	56.7	43.3	—
4. Ruthenia and	A	49	24.5	36.7	38.8	31	12.9	32.3	54.8	33	9.1	45.5	45.5	46	21.7	58.7	19.5
the Ukraine	B	14	14.3	50.0	35.7	15	20.0	46.7	33.3	15	26.7	46.7	26.7	14	14.3	71.4	14.3
5. Lithuania and	A	No data available															
Byelorussia	B	29	48.3	51.7	—	16	18.7	56.3	25.0	28	32.1	53.6	14.3	26	57.7	42.3	—
6. Silesia	A	59	23.7	71.2	5.1	49	8.2	83.7	8.2	57	21.1	63.2	15.8	54	39.0	46.3	14.8
	B	213	16.7	54.0	29.1	183	14.7	53.6	31.7	199	5.0	47.2	47.7	200	35.5	48.5	16.0
7. Bohemia	A	113	8.8	35.4	55.8	115	5.2	33.9	60.9	116	4.3	35.3	60.4	—	—	—	—
	B	24	—	70.8	29.2	21	—	52.4	47.6	26	—	50.0	50.0	11	9.1	72.2	18.2
8. Slovakia	A	No data available															
	B	10	×	×	×	15	20.0	33.3	46.7	10	×	×	×	11	36.4	54.5	9.1
9. Western Hungary	A	31	29.0	61.3	9.7	27	25.9	62.9	11.1	10	×	×	×	18	11.1	55.6	33.3
	B	No data available															
10. Northeastern	A	40	32.5	37.5	30.0	85	20.0	61.2	18.8	94	38.3	48.9	12.7	93	44.1	38.7	17.1
Hungary	B	30	16.7	36.7	46.7	40	22.5	52.5	25.0	27	29.6	40.7	29.6	45	44.4	42.2	13.1

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better than those of oats and rye. This is in agreement with the general finding that these two cereals yielded better crops: less of them was sown but the cultivation was more thorough.

In Mazovia and Podlasie (184 A ratios and a mere 12 B ratios) the rye yields were close to those in Great Poland and Pomerania, while those of wheat and oats were lower, and those of barley much better. Little Poland is represented very poorly: 71 A and 15 B ratios. If conclusions can be drawn from these meagre data, the rye yields do not in principle differ from those achieved in Great Poland. The yields of the other cereals are better. Ruthenia, the Ukraine, Lithuania, Byelorussia, and Silesia do not have data for this period. The same is true of Slovakia and, to some extent, also of Northeast Hungary. But the yields of wheat and oats, the only cereals about which we can say anything, have ratios generally of 2 - 4 or lower. Western Hungary is represented better (218 ratios of group A). The rye yields are poor here: 32.6 per cent of the ratios are in group 0 - 2, while 62.0 per cent are in group 2 - 4; the wheat yields are similar.

In period II the opportunities for comparison are confined to only four countries (Table II), since the relevant data are available only for Silesia (1014 ratios), Bohemia (426), Northeastern Hungary (454), Ruthenia and the Ukraine (217). Only Bohemia re-appears from the preceding period. The few ratios for Byelorussia and Lithuania (99), Western Hungary (86), and Little Poland (161) can be only of an illustrative nature. Actually speaking, therefore, it is not possible to make a comparison with the preceding period. It should be noted, however, that the yield ratios in Bohemia rose considerably. Whereas in period I ratios of group 2 - 4 predominated, the centre of gravity has now shifted to ratios higher than 4. They are higher than on Polish lands, including Silesia, and higher than in Hungary. This justifies the statement that even in period II (to be exact, prior to 1732), Bohemia had reached a level which all the other countries being compared did not attain until the second half of the 18th century. This is evident from the tabulation in which Bohemian yield ratios for period II have been arranged as for period III for the other territories (see Table 5). Comparison of Silesia with Ruthenia and the Ukraine comes out in favour of the latter; it has the highest percentage of ratios above 4 seeds. Despite the small number of ratios from Little Poland, comparison of this territory with Silesia distinctly gives the advantage to Silesia, especially in group B, and especially so, comparison with Byelorussia and Lithuania. Comparison of Silesia with Western Hungary comes out in favour of Silesia (rye and wheat), and with Northeastern Hungary, in favour of the latter (apart from oats).

In period III, the situation changes in a major way (Table III). In comparison with previous periods, we have many more ratios. Bohemia

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Table 5. Bohemian Yield Ratios for Period II

Cereal	Years	Ratios		% of ratios		
		Type	No.	0 - 3	3 - 6	6 or more
Rye	1720 - 1732	A	113	23.9	61.9	14.2
	1690 - 1732	B	24	29.2	62.5	8.3
Wheat	1690 - 1732	A	115	17.4	57.4	25.2
	1651 - 1750	B	21	4.8	95.2	—
Barley	1720 - 1732	A	116	15.5	60.3	24.1
	1690 - 1750	B	26	11.5	84.7	3.8
				0 - 2	2 - 4	4 or more
Oats	1666 - 1750	B	11	9.1	72.7	18.2

is not represented at all, while little data is available for Great Poland and Pomerania (152 ratios) as well as for Northeastern Hungary (121). An overall improvement can be discerned in yields.[53] In the countries of the Polish Commonwealth and in Silesia the 3 - 6 ratios predominate very distinctly, except for oats where ratios of 2 - 4 continue to be in predominance.[54] If the ratios of these groups do not exceed 50 per cent in several cases, they almost always constitute the largest group. An exception is that of wheat in Little Poland where the largest group consists of group A ratios above 6 (66.7%), but this deviation is compensated by a very large group of B ratios where ratios of 3 - 6 make up 51.4 per cent. With the exception of this one case, ratios of group 3 - 6 comprise from 43.5 per cent (wheat in Mazovia and Podlasie) to 69.4 per cent (rye in Little Poland).

As mentioned before, Bohemia attained a higher level of yields much earlier, in the early 18th century. In Slovakia, the ratios are in general better than in Poland, and especially better than in Hungary where the improvement in relation to the preceding period is not as distinct as in Poland. The relatively small number of ratios from Slovakia and Hungary makes this conclusion highly uncertain, particularly as ratios A and B are different in Hungary.

[53] Cf., the doubts of I. Rychlikowa, op. cit., p. 88, as to whether the improvement is not merely apparent since in period III more ratios are available for Silesia, Volhynia and Podolia where the yields were to have been much better than in other regions. Recently doubts concerning the agrarian revolution were raised by M. Morineau, *Histoire sans frontières Prix et "révolution agricole,"* "Annales," vol. XXIV, 1969, No. 2, pp. 410 - 411. The work of M. Morineau on the subject of "non révolution agricole" announced for 1968 is not known to us. It was to have appeared in "Cahiers des Annales."

[54] In our article in "Kwartalnik Historii Kultury Materialnej," vol. XIV, 1966, No. 3, p. 481, we pointed out that ratios of 4 - 7 (except for oats) comprise about 50 per cent of the cases noted. Calculations have shown that ratios of 3 - 6 should be taken as typical.

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Table III. Classification of Yield Ratios According to Frequency Period III

Country or Region	Ratio category	Rye				Wheat				Barley				Oats			
		No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios			No. of ratios	% of ratios		
			0 - 3	3 - 6	6 or more		0 - 3	3 - 6	6 or more		0 - 3	3 - 6	6 or more		0 - 2	2 - 4	4 or more
1. Great Poland	A	No data available															
and Pomerania	B	38	42.1	55.3	2.6	38	13.2	55.3	31.6	38	10.5	57.9	31.6	38	18.4	60.5	21.1
2. Mazovia and	A	140	12.1	53.6	34.3	131	19.8	43.5	36.6	140	20.0	55.7	24.3	135	22.2	54.8	23.0
Podlasie	B	77	10.4	74.0	15.6	77	9.1	50.7	40.3	75	8.0	68.0	24.0	77	15.6	57.3	27.1
3. Little Poland	A	49	18.4	69.4	12.2	51	5.9	27.5	66.7	50	10.0	66.0	24.0	53	3.8	66.0	30.2
	B	246	36.2	47.5	16.3	245	20.4	51.4	28.2	245	19.6	61.6	18.8	246	21.1	59.0	30.2
4. Ruthenia and	A	No data available															
the Ukraine	B	282	15.6	54.3	30.1	282	11.7	50.3	37.9	282	7.8	69.1	23.1	282	5.0	59.9	35.1
5. Lithuania and	A	No data available															
Byelorussia	B	101	30.7	45.5	23.7	92	29.4	44.5	26.2	99	27.2	44.4	28.3	98	32.3	42.8	24.5
6. Silesia	A	No data available															
	B	247	26.3	65.5	8.1	186	15.1	60.8	24.2	234	12.8	66.2	20.9	233	7.3	58.0	34.7
7. Bohemia	A	No data available															
	B	No data available															
8. Slovakia	A	18	5.6	61.1	33.3	18	—	44.4	55.6	18	5.6	77.8	16.7	18	—	16.7	83.3
	B	58	22.4	37.9	39.6	54	20.4	46.3	33.4	60	28.3	58.3	13.3	60	3.3	38.3	58.3
9. Western Hun-	A	61	50.8	49.2	—	65	61.5	32.3	6.2	43	51.2	34.9	13.9	49	32.6	42.8	24.5
gary	B	39	17.9	74.4	7.7	38	5.3	86.8	7.9	34	20.6	38.2	41.2	39	10.2	56.4	33.3
10. Northeastern	A	21	52.4	42.9	4.8	7	×	×	×	18	72.2	27.8	—	17	52.9	47.1	—
Hungary	B	14	21.4	57.1	21.4	12	8.3	50.0	41.6	10	×	×	—	22	22.7	40.9	36.4

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A general attempt to compare the yields on various lands in various chronological periods lacks clarity and precision inasmuch as the fluctuations cannot be couched in terms of figures. We cannot calculate the percentage differences between one region and another, or between periods I, II, and III. An attempt to represent graphically the variations in yields proved of little use: each such diagram (for every cereal and every period) would have to have a dozen-odd curves and such diagrams would be neither legible nor comparable.

It would be premature to draw any general conclusions on the basis of the material presented here. Nevertheless, one thing seems certain: the low yield of rural husbandry in feudal Poland was not an exception. In some neighbouring countries, e.g. Hungary and Slovakia, yields were similar, actually remaining at the same level so that no essential difference can be seen. In Central Russia as well — as far as we know the results of studies there — yields in the vicinity of 2 - 4 seeds predominated at the turn of the 16th to 17th centuries.[55] Only Bohemia in period II clearly outdistanced Poland and the other countries mentioned above, provided further investigations do not amend our conclusions. For Bohemia attained much higher yields, which Poland, Hungary, and Slovakia were not to reach until period III.

At this point, however, attention must be drawn to an important circumstance which distinguished the countries of the Polish Kingdom from Bohemia and Hungary, namely that large amounts of grain were exported from Poland whereas exports from Bohemia in the period prior to Běla Hora [56] and from Hungary up until the mid-18th century were insignificant or non-existent.[57] In Bohemia, surpluses were consumed on the spot by the non-agricultural population. In Hungary, moreover, the large Habsburg army was a major consumer. It would be the objective of further studies to determine how these phenomena affected consumption and, in general, what impact they had on the living standards of the producers themselves. We are in agreement with B. H. Slicher van Bath who placed Poland and Bohemia — this researcher makes no mention of Hungary — among countries with low yields, although it would seem that the concept

[55] N. A. Gorskaja, *Urožainost' zernovych kul'tur central'noj časti russkogo gosudarstva v konce XVI - načale XVII v.* in: *Ežegodnik po agrarnoj istorii Vostočnoj Evropy,* Riga 1963, pp. 154 - 164.

[56] V. Sádová, *Eksport czeskiego zboża do Niemiec a rozwój gospodarki towarowej w Czechach w okresie przedbiałogórskim* [*Exports of Bohemian Grain to Germany and the Development of Commodity Economy in Bohemia in the Period Prior to Běla Hora*], "Roczniki Dziejów Społecznych i Gospodarczych," vol. XXII, 1960, pp. 31 - 52.

[57] Zs. Kirilly, et al., op. cit., p. 609.

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of this scholar for calculating yield ratios for entire groups of countries, and for long periods at that (1550 - 1820), is not realistic.[58] In this way one would lose sight of the entire dynamics and variety of the phenomena under study. A matter to be taken up in further investigations would be that of the social and economic consequences of the low efficiency of feudal agriculture, that is, the genesis and development of the system of corvée and serfdom, the concentration of landed property,[59] the poverty of the rural population, famine years, and other such phenomena.

(Translated by Eugeniusz Lepa)

[58] B. H. Slicher van Bath, *Yield ratios*, p. 16. This is an abstract from an article by the same author *De oogstopbrengsten van verschillende gewassen, voornamelijk granen, in verhouding tot het zaaizaad ca. 810 - 1820*, "A. A. G. Bijdragen," vol. IX, 1963, pp. 29 - 125. Probably the same in English, *The Yields of Different Crops (mainly cereals) in Relation to the Seed c. 810 - 1820*, "Acta Historiae Neerlendica," vol. XI, 1967, pp. 26 - 106. (Cf. footnote 2).

[59] W. Szczygielski correctly drew attention to this, *Le rendement de la production agricole en Pologne du XVI^e au XVIII^e siècle sur le fond européen*, "Kwartalnik Historii Kultury Materialnej," vol. XIV, 1966; "Ergon," vol. V, p. 802.

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