



Agricultural Productivity in the Western Borderlands of the Grand Duchy of Lithuania (Second Half of the Sixteenth Century)

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The purpose of this article is to determine the grain yields in the royal manors of the Grand Duchy of Lithuania in the 16th and 17th centuries. The manorial system in the Grand Duchy of Lithuania appeared with the land reform in the mid-16th century (*Volok* Reform), when the three-field system was introduced here. However, there were far fewer manor farms in Lithuania than in Poland, but they were very large. Most of them produced grain for export based on peasant labor force. The inventories of the royal estates give account on the seed demand and yields of the most important cereals: rye, oats and wheat. The analysis of more than a dozen manors showed varying yields in Lithuanian estates (Grodno Starosty, Brest Ekonomy and Kobrin Ekonomy), which were due to natural environmental conditions, as well as elemental disasters or human activity.

Keywords: grain yield, productivity, 16–17th-century Lithuania, *volok* reform, manors

Introduction: State of Research

Studies on crop yields in the Polish–Lithuanian Commonwealth have a deep tradition. The most extensive analysis of the productivity of peasant and manorial farms was done by Alina Wawrzyńczyk¹ and Leonid Żytkowicz² over 50 years ago, focusing mainly on royal and church estates in early modern Poland. Other prominent scholars of the economy of early modern Poland have also paid attention to agricultural productivity, including Jerzy Topolski, Andrzej Wyczański, and Stefan Cackowski.³ Piotr Guzowski and Monika Kozłowska-Szyc are also currently pursuing research on the subject.⁴ The conditions of the

1 Wawrzyńczyk, “Próba”; Wawrzyńczyk, *Gospodarstwo chłopskie*; Wawrzyńczyk, *Studia nad wydajnością*;

2 Żytkowicz, *Studia*; Żytkowicz, “Plony zbóż.”

3 Wyczański, *Studia nad gospodarzką*; Wyczański, “O badaniu plonów”; Topolski, *Gospodarstwo wiejskie*; Cackowski, *Gospodarstwo wiejskie*.

4 Guzowski and Kozłowska, “Wysokość plonów”; Kozłowska-Szyc, “Wysokość.”

agricultural economy in the Grand Duchy of Lithuania have also long remained at the center of research by historians. Most of the scholarship has been devoted to the period of the *Volok* Reform⁵ in the second half of the sixteenth century, in particular to the layout of manors and the lists of the duties of serfs.⁶ Several works also dealt with the efficiency of agriculture in medieval Lithuania. The economics of the Roch demesne (Novogrudok province) and the Trotsinski estate (Brest–Lithuanian province) were analyzed by Rożycka-Glassowa.⁷ Jozef Ochmański wrote about the efficiency of the grand ducal economy in the Kobrin ducal estate.⁸ Also, Stanisław Kościalkowski examined the significance of Lithuanian yields, supported by yield estimates made by Antoni Żabko-Potopowicz in selected grand ducal estates in the eighteenth century.⁹ Thus, the scholarship on the agricultural economy of the Grand Duchy of Lithuania and its efficiency are for the most part several decades old. A recent summary of the research was presented by Alina Czapiuk in the 1990s,¹⁰ but this research and the various works of secondary literature mentioned by Czapiuk are in need of an update, urging for some comparative focus on similar questions in other regions.

Case Studies: Selection of the Analyzed Area

Though numerous shorter works of secondary literature have been published on the subject, there is still a lack of a more complete work focused on the study of the functioning of the agricultural economy in the second half of the sixteenth century. I neither intend nor claim, in the discussion below, to discuss all aspects of the productivity of Lithuanian agriculture in the Renaissance. I present my

5 A 16th-century land reform in parts of the Grand Duchy of Lithuania (Lithuania proper, Duchy of Samogitia and parts of White Ruthenia). The private initiative was copied by other nobles and the Church, because the reform increased effectiveness of agriculture by establishing a strict three-field system for crop rotation. The land was measured, registered in a cadastre, and divided into voloks (21.38 hectares or 52.8 acres). Volok became the measurement of feudal services (like *sessio* in the Kingdom of Hungary). The reform was a success in terms of the annual state revenue that quadrupled. In social terms, the reform promoted development of manorialism and fully established serfdom in Lithuania, limiting social mobility. (Remark of the editor)

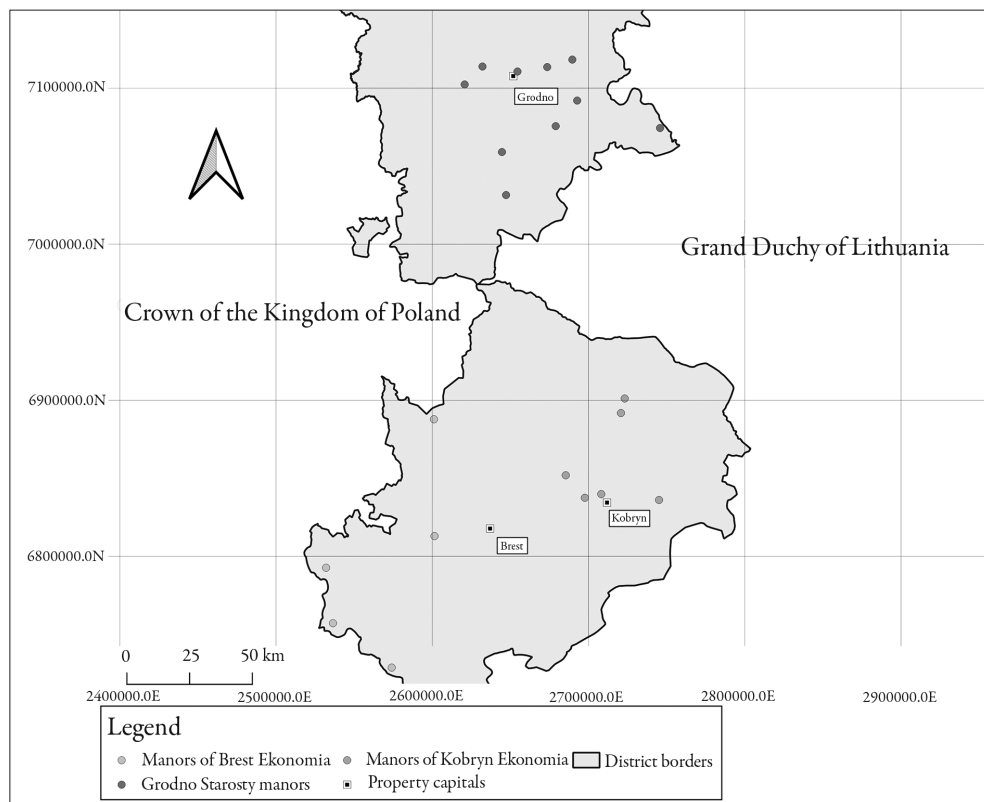
6 Daunar-Zapolski, *Dzjyustvennaya gazpadarka*; Picheta, *Belorussija i Litva*; Jurkiewicz, “Czynsz i pańszczyzna”; Łożyński, “Stan gospodarczy.”

7 Rożycka-Glassowa, *Gospodarka rolna*.

8 Ochmański, “Gospodarka folwarczna.”

9 Żabko-Potopowicz, *Praca i najemnik*; Kościalkowski, *Antoni Tyzenhauz*, vol. 2, 62–68. Primarily it concerns the fact that the sources referring to the grand ducal estates from the 1780s provide just *lucrum ziaren do intraty*, so only the crops that were sold and not all the crops that were harvested.

10 Czapiuk, “Uwagi,” 131–37; Czapiuk, “Reformy”; Czapiuk O plonach.”



Map 1. Location of farms in the Grodno Starosty (1578), Brest *ekonomia* (1588), and Kobryn *ekonomia* (1597)

Source: Own compilation based on, AGAD, AK, sign. I/10, pp. 23, 97, 127, 171, 194, 238, 266, 296–297; AGAD, ASK LVI, sign. 11, k. 16, 21v, 24–24v, 28v, 32v–35v; AGAD, The so-called Lithuanian Metryka, sign. 29, pp. 28, 34–36, 51–52, 71–73, 89–90, 101.

findings primarily with the aim of furthering a more nuanced interpretation of the findings of research focusing on regions to the east of the (quite thoroughly studied) Kingdom of Poland. This will make it possible to include further areas in the analysis of the manorial system.

In order to discuss agricultural production in the Grand Duchy of Lithuania from the perspectives of total yield and quality, I focused on three estates as case studies: the Grodno royal estates (1578),¹¹ the Brest royal estates (1588), and the

11 The ambiguity of the Grodno estate's name results from the differences in the printed and archival sources, where both names appear, as well as *woloschi grodzjeńskie*. For the purposes of the discussion here, I use the name of Grodno Starosty, which I presume on the basis of several sources to have been in use in 1578. Golovatskiy et al., *Pistsovaya kniga Grodnenskoj*, vol. 1, III, 3; Golovatskiy et al., *Pistsovaya kniga Grodnenskoj*, vol. 2, 25–26; AGAD, AK, sign. I/10, p. 1–3.

Kobrin royal estates (1597). This selection was not random. In accordance with the 1588 Privilege of Counties on the Table of His Majesty the King, some of the Lithuanian royal (state) properties were transformed into *ekonomias*, or in other words, they put under the control of the monarch and generated a significant share of the income of the court treasury.¹² The existence of Lithuanian *ekonomias* was confirmed in 1589, and in 1590, in accordance with legislation passed by the parliament the royal table estates in Poland were also separated.¹³ *Ekonomias* were usually large estates which included several towns, several manors, and dozens or even hundreds of villages. *Sejm* acts mention 11 *ekonomias*. Five of them (Tczew, Malbork, Rogozin, Sandomierz, and Sambor) belonged to Poland, as did the Cracow grand-government and a number of *regalia*. Another six *ekonomias* (Brest, Grodno, Kobrin, Mogilev, Olitsa, and Šiauliai) were within Lithuania. Our goal, therefore, was to select relatively extensive areas for the study of relationships on the landlords' estates.

Characteristics of the Sources

Most of the court estates have well-preserved treasury sources from the second half of the sixteenth century. The documents which were drawn up during the period of the *Volok* Reform, are widely known among scholars.¹⁴ The documents offer detailed descriptions of the land, the boundaries of the manors, towns, and villages, and the duties of the serfs, but they reveal little concerning the extent of production on the grand ducal farms. Only inventories from the 1570s and 1590s make it possible to analyze the productivity of manorial farms, in addition to examining a number of duties of the populations living on the estates. The inventories of the Brest and Grodno estates were compiled after the deaths of the previous possessors.¹⁵ This is not true in the case of the source on Kobrin's *ekonomia*, which was created at the express order of King Sigismund III Vasa, who did not give any specific reason for his command.¹⁶ The estates included in this study were found in the western stretches of Lithuania, in Grodno and Brest-Litovsk Counties.

12 AGAD, AK, sign. I/7, pp. 1–3.

13 *Volumina Constitutionum*, vol. 2, 106, 116, 148.

14 Golovatskiy et al., *Pistsovaya kniga byshbago Pinskago starostva*; Golovatskiy et al., *Pistsovaya kniga Grodnenskoj*, vol. 1, III, 588; Golovatskiy et al., *Pistsovaya kniga Grodnenskoj*, vol. 2, 25–166.

15 AGAD, AK, sign. I/10; AGAD, ASK, LVI, sign. 11.

16 AGAD, Metryka Litewska, sign. 29.

The Crop Yields

There are two basic methods for examining a farmer's harvest. The first method involves taking the number of threshed crops and dividing the harvest by the size of the previously sown crop (which gives the yield ratio). Thus, we talk about the ratio of one seed sown to one grain harvested. The methodology requires following rules:

1. The study of the proportion of seeds sown to grain harvested must be limited to individual crop species. Thus, we do not deal with the combined yields of rye and wheat unless, for example, we are interested in the yield of winter cereals, which, however, requires appropriate separation of the data.

2. Analysis must be based on standardized units of bulk measures. If a source only offers information concerning seeds sown counted in threescores¹⁷ and information about the harvest as measured in barrels, we are not able to give the yield of a particular crop. However, if we were to break this data down (for instance, to arrive at an approximation of the number of grains in a barrel), then the source might contain useful information concerning the yield per threescore.

The above method has been widely used in historical and contemporary scholarship on agriculture in the Polish and Lithuanian lands. Certainly, one of the great advantages of this methodology is its comparative simplicity, assuming we have reliable data in consistent units of measurement.

Another strategy is to indicate crop yields by presenting yield efficiencies in terms of the number of quintals per hectare. This method forces the historian to calculate older units of bulk and area measurements into modern ones. It is thus more time-consuming, as it requires knowledge of several conversion factors. Unfortunately, it is sometimes completely unreliable if the sources do not indicate the size of a given farm. The aforementioned method is used by scientists analyzing agriculture in Western Europe (for instance), but Polish researchers also do not shy away from using the method of estimating yields in quintals per single hectare.¹⁸ Due to the difficulty of determining the acreage of old manor farms, we chose the first method of analysis, showing the yields as a ration of seeds down to grains harvested.

17 A conversion unit of about 60 sheaves of a given crop.

18 *Historia Polski w liczbach*, 78, 215, 218; Santiago-Caballero, "Provincial grain yields in Spain"; Cerman, *Villagers and lords*, 101. There are other methods of presenting data on yields, e.g. in bushels per acre. Campbell and Overton, *A New Perspective*, 70.

For the analysis, we chose all the manors on each estate: ten on the Grodno Starosty, five on the Brest estate, and six on the Kobrin *ekonomia*. In the sources provided precise data on crops sown, harvests counted in threescores, and threescore efficiency rates. In accordance with the VoloK Law regulating relations on the grand ducal estates, all estates used the system of a barrel of brine, equal to four Cracow bushels.¹⁹

Table 1. Average crop values on the Grodno Starosty, Brest and Kobrin *ekonomias* (1578–97) (yield measured to sown seed)

Property	Winter rye	Spring rye	Winter wheat	Spring wheat	Barley	Oats	Peas	Buckwheat
Grodno Starosty	2.7	1.2	2.5	4.6	2.8	1.9	2.6	2
Brest Ekonomia	3.9	2.6	4.6	2.9	2.8	2.5	3	1.8
Kobrin Ekonomia	2.5	1.6	1.2	0.3	2.7	2.1	2.6	2.5

Source: Own compilation based on, AGAD, AK, sign. I/10, pp. 23, 97, 127, 171, 194, 238, 266, 296–297; AGAD, ASK LVI, sign. 11, k. 16, 21v, 24–24v, 28v, 32v–35v; AGAD, The so-called Lithuanian Metryka, sign. 29, pp. 28, 34–36, 51–52, 71–73, 89–90, 101.

The Table 1 shows the arithmetic average yield on the Grodno Starosty and the manors on the Brest and Kobrin estates in the second half of the sixteenth century. The data suggests that spring wheat was one of the most successful crops on the Grodno estate. In practice, however, this crop was grown on only one grange of the Grodno estate, which in principle excludes the sense of including data on average yields. The data for winter wheat on the Brest estate were identical, although this crop was only grown the farms belonging to three landlords. Quite good values were generated by winter rye on the Brest *ekonomia*, which usually boasted the best indicators of manor management efficiency. The weakest yield parameters were obtained by spring rye and oats, the average figures for which, as a ratio of grains harvested to seeds sown, ranged from 1.2 to 2.6 and from 1.9 to 2.5, respectively. A comparison of average yield values on these estates to average yields shows that in most cases the Lithuanian estates were not nearly as productive or efficient as the estates in Poland, for example, where the corresponding figures were 3.2–5 for rye, 4.3–7.6 for wheat, 4.5–8

¹⁹ Jaroszewicz, *Ustawa na wołoki*, 238–39; *Encyklopedia Historii Gospodarczej*, vol. 1, 344; Boroda, *Pojemność miar nasypnych*, 24.

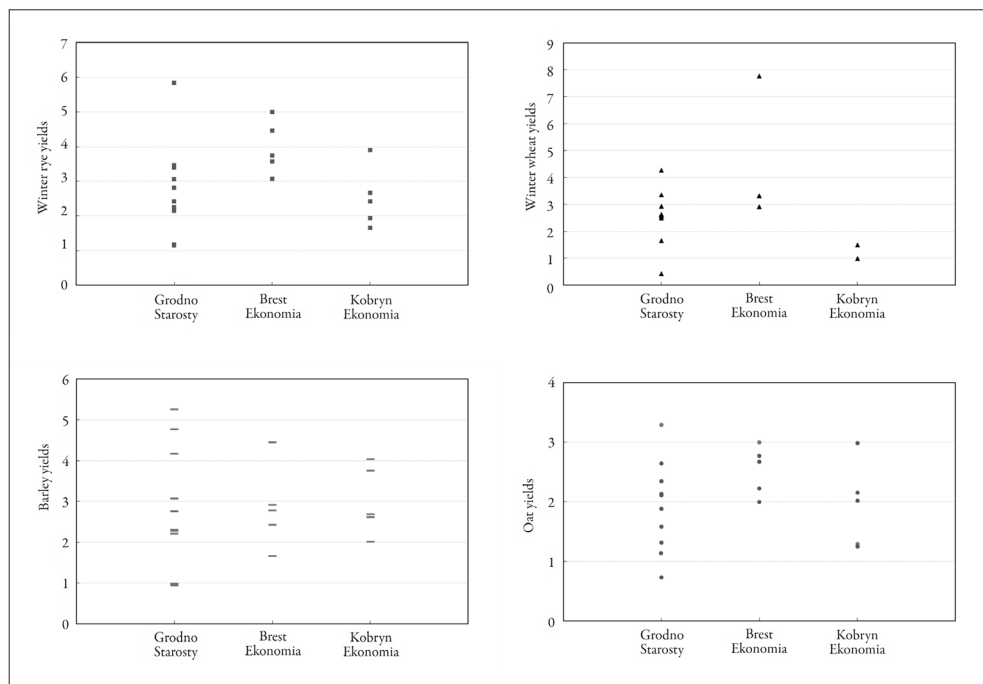


Figure 1. Variability of yields of winter rye, winter wheat, barley, and oats on the Grodno Starosty, Brest *ekonomia* and Kobryn *ekonomia* (1578–97)

Source: Own compilation based on, AGAD, AK, sign. I/10, pp. 23, 97, 127, 171, 194, 238, 266, 296–297; AGAD, ASK LVI, sign. 11, k. 16, 21v, 24–24v, 28v, 32v–35v; AGAD, The so-called Lithuanian Metryka, sign. 29, pp. 28, 34–36, 51–52, 71–73, 89–90, 101.

for barley and 1.8–7 for oat.. The averages for the harvests on the grand ducal estates better resemble the yields obtained in Ducal Prussia (rye: 3.5; wheat: 5; barley: 4; oats: 2.8).²⁰ In comparison with Poland and Prussia, wheat did not fare nearly as well, achieving a similar average only on the Brest economy. Yields were much lower on the other estates, reaching just over one to about 2.5 grains per seed sown.

In addition to indicating the average yield, it would be worth considering the variety of parameters obtained. To this end, one could approach the issue from a comparative discussion of data concerning the yields of four of the most important crops: winter rye, winter wheat, barley, and oats. The focus on these

²⁰ Cerman, *Villagers and lords*, 96. Rye crop yields were also much lower than in the collations referring to the relatively close Knyszyn Starosty in Podlasie. Czapiuk, “Uwagi,” 135–36.

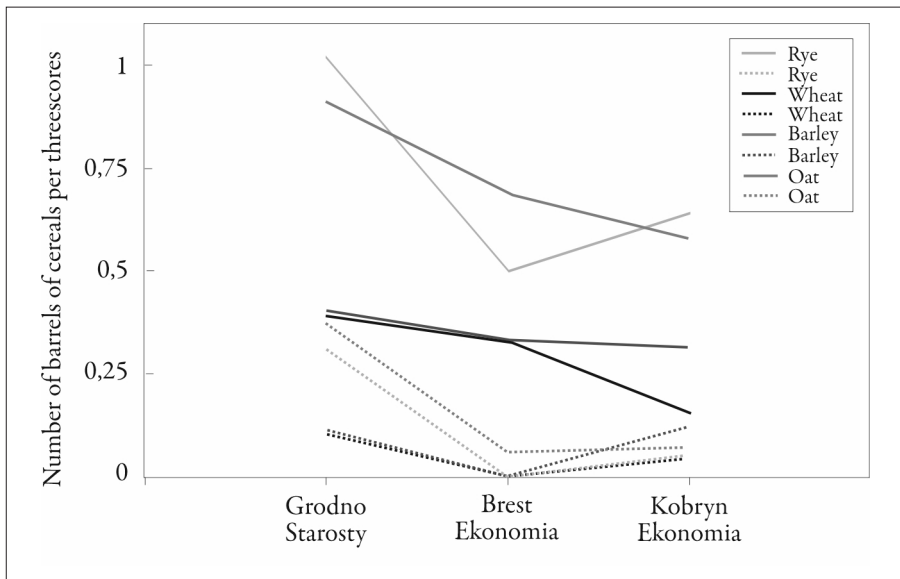


Figure 2. Productivity of crops on the farms of Grodno Starosty and the Brest and Kobryn *ekonomias* (1578–97) in barrels/threescore. Average values are indicated by a solid line, and the standard deviation by a dashed line.

Source: Own compilation based on, AGAD, AK, sign. I/10, pp. 23, 97, 127, 171, 194, 238, 266, 296–297; AGAD, ASK LVI, sign. 11, k. 16, 21v, 24–24v, 28v, 32v–35v; AGAD, The so-called Lithuanian *Metryka*, sign. 29, pp. 28, 34–36, 51–52, 71–73, 89–90, 101.

four crops is dictated by two factors: they achieved the highest yields among grains and these regularly appeared in the farm accounts.

Fluctuations in yields are evident throughout the study of any selected crops. Only some manors achieved similar yield values, which clearly escape us when focusing only on average grain yields. We see the greatest differences in yields in the case of the manors of Grodno Starosty, which could be due to the larger number of farms owned by lords and not the king. The condition of crops on some of the grand ducal farms presents a remarkably unfavorable picture. This is evident in the case of particularly poor yields of spring and winter wheat, where the yields sometimes approached the lower limit of profitability.

The reasons for the unevenness of the harvest are quite well explained by an analysis of the treasury sources. In 1578, the Grodno Starosty was plagued by hailstorms and fires in selected villages. It is likely that the recorded drought was indirectly responsible for the fires, such under such circumstances, a moment of carelessness with fire would have been enough for buildings to start burning

quite quickly.²¹ The mention in the records of uprooted garden crops also suggest drought conditions (though it is not known whether these crops were uprooted as a result of human activity), but there are other direct references to the disastrous yields too. Usually, lower yields occurred on manors where the records also indicate unfavourable weather events (Horodnica, Mosty).²²

Let us take a look at how the efficiency of a single, threshed threescore of crops presented itself. As with the first chart, the target of the analysis will be winter varieties of rye, wheat, barley, and oats.

As the survey of the west-Lithuanian estates indicates, the maximum results were obtained for winter rye and oat crops. If we look at the average yield of a single mound of individual crops, it becomes clear that the highest yields were obtained on the Grodno estate. Simultaneously, the Grodno estate had the most varied crop threshing parameters. The average threshing rates per threescore oscillated around one barrel of brine. The crop yields were smaller on the Brest and Kobrin *ekonomias*. Barley and oat yields were similar. On average, barley and oat yields were noticeably better on the Grodno estates and worse on the other estates. The threescore yield on the Brest *ekonomia* showed variation only in the case of oats. The poor values of threescore of wheat are confirmed in the source dedicated to the Kobrin property, where a very bad wheat yield is mentioned.²³ The accounts of the Kobrin *ekonomia* were also inaccurately kept, since in the case of the Horoddec manor we have no data at all on the threshing or yields of rye or oats.²⁴

The agricultural conditions on the estates under discussion were certainly also influenced by the number of livestock. Livestock breeding made it possible not only to obtain meat, hides, and dairy products. Livestock were also used in the fields, for instance in ploughing. In addition, livestock produced a certain amount of fertilizer, which made it possible to achieve higher yields of grain crops. As the sources do not always give a precise record of all the animals on a given manor, I consider only the presence of cows, as the records concerning cows on the estates are more precise.

21 AGAD, AK, sign. I/10, p. 27, 28, 31, 97, 180, 239, 258, 299.

22 AGAD, AK, sign. I/10, p. 20, 97.

23 AGAD, Metryka Litewska, sign. 29, 72.

24 AGAD, Metryka Litewska, sign. 29, 101.

Table 2. Number of milking cows and heifers on the farms of Grodno Starosty and the Brest and Kobrin *ekonomias* (1578–96)

Estate	Manor farm	Number of cows	Number of cows per Lithuanian volok of the farm ²⁵
Grodno Starosty	Horodnica	6	0.6
	Nowy Dwór	12	0.3
	Kotra	11	2.7
	Odelsk	0	0
	Skidel	0	0
	Łabno	6	0.2
	Jeziory	4	0.3
	Salaty	0	0
	Mosty	5	0.3
	Wiercieliszki	18	1.5
	Milkowszczyzna	0	0
	Krynki	0	0
Świsłocz	16	1.7	
Brest <i>ekonomia</i>	Woin (Wohyń)	0	0 ²⁶
	Kodeniec	0	0 ²⁷
	Połowce	–	–
	Kijowiec	11	0.9
	Rzeczycza	–	–
Kobrin <i>ekonomia</i>	Kobryń	5	1
	Czerwaczyce	13	2.3
	Wieżece (Wieżki)	6	0.2
	Prużany	16	0.5
	Czachec	–	–
	Horodec	5	1.6

Source: Own work on the basis of AGAD, AK, sygn. I/10, 22, 51, 94, 170, 193, 237, 264, 294, 297; AGAD, ASK LVI, sign. 11, 16, 27; AGAD, Metryka Litewska, sign. 29, 28, 33–36, 50–53, 70, 73, 89–90, 101.

The recommendations of the Volok Law of 1557, which regulated relations on the estates surveyed, said that each manor should have at least 20 cows. If a lord's farm did not have that many animals, he was ordered to obtain more by purchase.²⁸ The sources indicate that already by the late 1570s the Grand Duke of Lithuania's instructions were not being followed. A survey of estates with a certain number of cattle shows that the Grodno estate had an average of 8.5, the Brest *ekonomia* 3.6, and the Kobrin *ekonomia* 9 mature cows per farm

25 One Lithuanian *volok* is roughly 21.3 hectares, Ochmański, "Gospodarka folwarczna," 372.

26 The cowshed was ravaged and probably emptied by Mielnik Chamberlain Kasper Dembinski during the 1588 interregnum, AGAD, ASK LVI, sign. 11, 27.

27 This property was also ravaged by the Mielnik Chamberlain. AGAD, ASK LVI, sign. 11, 24

28 Jaroszewicz, *Ustawa na woloki*, 243.

(Table 2). We should approach the above data with a great deal of caution. The Milkovshchyna, Odelsk, and Skidel manors, which were on the Grodno estate and were leased by the widow of the late Grodno starost and the Vilna voivode, were not included in the survey.²⁹ This certainly contributed to lower average numbers of livestock in the records. Similarly, we should not trust the information from the Brest *ekonomia*, where we know the number of livestock for only one lord's farm. However, the number of livestock on the Lithuanian estates was much lower than, for example, on the estates in the neighboring Knyszyn Starosty (Podlasie), where there was an average of 41 cows (milking and barren) per single manor.³⁰ Recalculation of the number of milking and barren cows per Lithuanian volok shows considerable diversity in cattle. Values varied the most on the Grodno Starosty, but because of the single census of the cowshed in the Brest *ekonomia*, we cannot make a full comparison of livestock on the estates under study.

Conclusion

The above observations call attention to the differences in the crop yields on the farms of the Grodno Starosty and the Brest and Kobrin *ekonomias*. The best yields were generated by the crops of the Brest property, which usually had better agricultural conditions. Typically, Kobrin's *ekonomia* had the least productive harvests. This was probably related to the generally inferior conditions of the estate, as evidenced by the few mentions of wheat fertility or the poor condition of agriculture in 1597. The Grodno Starosty was also plagued by unfavorable natural events that reduced the quality of manor crops. However, there is no need to overestimate the negative effects of weather phenomena that periodically afflicted societies in modern Europe. In the case of some estates, it is likely that crop yields were only recorded in the wake of adverse weather events. However, the results of the study show primarily the inferior efficiency of the manor economy on the estates of Western Lithuania, which clearly differed from the situation in the neighboring Kingdom of Poland. The comparatively low crop yields on the estates discussed above were certainly affected by the low numbers of livestock, resulting not only from robberies suffered by the nobility during the interregnum, but probably also from real shortages in the number of livestock.

29 AGAD, AK, sign. I/10, 1.

30 Czapiuk, "Uwagi," 136–37.

It would certainly be worthwhile to undertake further research on the efficiency of agriculture on the Grodno Starosty and the Brest and Kobrin *ekonomias*, as this research would show (at least, the discussion above suggests so) that the farms owned by the landlords continued to produce comparatively poor crop yields.

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